

# ANNALS

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1. *Contributions to the Crustacean Fauna of South Africa.*—By K. H. BARNARD, M.A., F.L.S., Assistant Director.

#### No. 7. CIRRIPIEDIA.

(With Plate I.)

THE collection of barnacles in the South African Museum is derived almost entirely from the investigations of the Cape Government trawler “Pieter Faure.” It consists, therefore, with few exceptions, of material from shallow and moderately deep water and not from the littoral zone. Collectors seem to have paid little attention to the littoral barnacles of this region.

In Stebbing’s 1910 Catalogue of South African Crustacea 26 species of barnacles—10 stalked, 15 sessile, and 1 other—are recorded. The present report brings the number up to 74—40 stalked, 32 sessile, and 2 others. The greatest increase is thus in the stalked barnacles, and especially in the family *Scalpellidae*. Of this family only 2 species were formerly known to inhabit these waters as against 20 now recorded.

The family *Verrucidae*, however, still remains unrepresented: which seems not a little remarkable.

With regard to the *Scalpellidae*, there appears to be a local or indigenous fauna consisting of species distinct from, though often closely allied to, species living in other seas. On the other hand, a few species previously known from the North Atlantic or Indo-Pacific oceans have been rediscovered here.

But the most interesting result of the examination of the members of this family, strictly speaking of the genus *Scalpellum*, is the proof

that in over half the South African species there is *no free-swimming* larval stage as is so characteristic in nearly all other Cirripedes. A general summary of these results together with a review of the previous literature is given in the first part of this paper.\*

In the second part the collection is dealt with systematically. Species recorded from these waters but not represented in the collection are inserted in their proper places.

The keys in the present paper are not intended to express the natural relationships, but merely to form a convenient means of identification. In drawing them up I have availed myself of the works of Pilsbry and others, modifying and adapting only where necessary.

As well as a general acknowledgment of indebtedness to other workers, my thanks are especially due to Dr. Pilsbry and Dr. Annandale for sending me copies of their papers, some of which would otherwise have been inaccessible to me.

#### I. THE LARVAL STAGES IN THE GENUS *SCALPELLUM*.

On the larval stages in this genus, which is taken *sensu stricto*, and does not include *Smilium* or *Calantica*, the only papers to which reference need be made are the following :—

- (1) 1851 and 1854. Darwin, Monogr. Cirrip. : (i) Lepadidae, (ii) Balanidae.
- (2) 1883. Hoek, Challenger Rep., vol. viii.
- (3) 1884. Hoek, Challenger Rep., vol. x.
- (4) 1894. Aurivillius, Studien über Cirrip. K. Sv. Vet. Ak. Handl., vol. xxvi, No. 7.

(5) 1899. Hansen, Cladoc. and Cirrip., Plankton Exp., vol. ii.

(6) 1907. Hoek, Siboga Exp. Monogr., 31a. Cirrip. Pedunculata.

(1) Darwin (i, p. 9 ; ii, p. 103, pl. xxix, fig. 8) has described and figured a larva of *S. vulgare* in the first stage "immediately after coming out of the egg." It is a *Nauplius* larva, the later development of which was unknown to Darwin. Nor, so far as I am aware, has the life-history of this species since been worked out. Darwin also noted (i, p. 221) the remarkably large size of the ova in this genus.

After the publication of Darwin's Monograph the investigations of Claus and others placed our knowledge of the life-histories of the

\* It is as well to state that this MSS. was completed in 1916. I have left my remarks on the larval stages as originally written, merely adding an extra paragraph correlating my results with those of Nilsson-Cantell published in 1921.

*Cirripedia* on a firm basis. And it seemed to be assumed that all the members of the group agreed with the types examined in possessing a free-swimming *Nauplius* stage.

(2) In 1883, however, while studying the collections made by H.M.S. "Challenger," Hoek made the interesting discovery that a specimen of *S. stroemii* from 516 fathoms contained larvae which had already reached the *Cypris*-stage in the mantle cavity of the ♀ (p. 75, pl. viii, fig. 1). This larva is in a very early *Cypris*-stage, and might almost be termed a *Metanauplius*, except that the cirri and caudal appendages are already developed, which is not the case, at least not to such a degree, in the typical *Metanauplius*. The "exuviae of the *Nauplius*" I regard as the egg-membrane or chorion. Hoek also noted the comparatively small number and the large size of the embryos.

Further, it is stated under *S. triangulare* that "among the eggs, which entirely fill the cavity of the capitulum," a larva in the *Cypris*-stage was observed. This evidence is not adduced in support of the remarks made under *S. stroemii*.

(3) The same author, while dealing with the "Challenger" collection from an anatomical point of view, refers to the *Cypris*-larva of *S. triangulare* (p. 8, pl. ii, fig. 4), and says: "I think it is in this stage that the *Cypris*-larva leaves the mantle cavity of the mother." This remark stands entirely by itself, again with no reference to the discovery of *Cypris*-larvae in *S. stroemii*. Yet in itself it implies that development without a free-swimming stage is the normal course, and well known to students of Cirripedes.

(4) In 1894 Aurivillius published an important paper in which, besides describing the species, he paid particular attention to the post-embryonic development in the deep-sea species, comparing it with that of shallow-water or pelagic species. He does not refer to Hoek's observations.

The results of Aurivillius' studies were as follows:—

*S. septentrionale* Auriv. (p. 52). Examples from 600–675 metres contained "numerous" embryos in the "first post-embryonic stage," similar to those found in:—

*S. erosum* Auriv. (p. 54, pl. ix, fig. 5) from 1744 metres. Here also "numerous" embryos were found which, from the figure and description, exactly resemble the embryos found by Hoek in *stroemii*. This larva corresponds with the *Metanauplius* stage, with 4 anterior pairs of appendages, but has in addition the beginnings of the cirri and caudal appendages.

*S. obesum* Auriv. (p. 57, pl. ix, fig. 6) from 110 metres. In this case the fully developed *Cypris*-stage was found.

*S. cornutum* Sars. (Auriv., p. 62) from 46–90 metres. *Cypris*-larvae as in *obesum*.

*S. prunulum* Auriv. (p. 63) from 350–600 metres. *Cypris*-larvae as in *obesum*.

Aurivillius sees in this cutting-out of a free-swimming *Nauplius* stage an adaptation to “deep-water” conditions. His own facts, however, scarcely support this. While it is true that the 1st, 2nd, and 5th species may be termed “deep-water” inhabitants, *obesum* and *cornutum* certainly cannot. Nor is there any great difference between 46 metres, at which *cornutum* was found, and 30 metres, at which *vulgare* is stated to be found. Yet Aurivillius has contrasted (p. 55) the life-history of this latter species, possessing, according to him, a free-swimming stage, with that of the “deep-water” species without a free-swimming stage.

(5) These discoveries of Hoek and Aurivillius seem to have evoked little interest. In Gruvel's Monograph (1905) I can find not even a passing reference to the fact that an abbreviated life-history had been discovered in certain species of *Scalpellum*. They were, however, noticed in a footnote by Hansen, an author who is always careful with regard to the earlier literature of his subject, in his report on the Cirripedes of the Plankton Expedition (p. 16).

(6) The only other reference to an abbreviated life-history, of which I am aware, is that made by Hoek in 1907. Here also it is remarkable that, although Hoek has seen the provisional descriptions (in 1892) of the species described by Aurivillius, he seems quite ignorant of the 1894 paper. He merely refers to his original observation in the Challenger Report (1883), and remarks that “from that discovery” there can be no doubt that “there are *Scalpellums* which develop without a free-swimming *Nauplius* stage,” and that these are “deep-sea species” (p. 73).

From a study of a specimen of *S. stearnsi*, var. *robusta*, he further adduces evidence that not only the ♂ but the ♀ also develops in this manner. But no *Cypris*-larvae were found actually within the capitulum of the large ♀. Figures are given of a young animal creeping out of the *Cypris*-shell and of one recently attached.

The only remark I have to make on this is that the young animal probably does not creep out of the *Cypris*-shell, but attaches itself while still within the shell. My reasons for this are: firstly, the (by no means conclusive) one of analogy with *S. valvulifer* and

*eumitos* (pp. 19, 36, *infra*), as well as with the known facts of the life-history of *Lapes* and *Balanus*; secondly, that Hoek's fig. 10 on pl. vi shows no antennae or indication of attachment, and that the figure gives the impression not of a young animal *creeping out* of the *Cypris*-shell but of a *Cypris*-larva *expelled from* its shell by convulsive movements due to the action of the preservative fluid. In support of this it is to be noted also that no indications of the primordial valves are represented except that of the tergum.

I do not wish to imply that an exactly similar mode of growth occurs in every species of the genus; only to accentuate the necessity of further observations on this point by contrasting Hoek's statements with what occurs in the South African species *valvulifer* and *eumitos*. Here the *Cypris*-shell is not cast off until the animal is fixed and the primordial valves of the terga, scuta, and carina are developed.

In two of the Siboga species Hoek has found ova: 17 in *sessile* (p. 90), measuring  $\cdot 47 \times \cdot 27$  mm., and 53 in *gracile* (p. 107), measuring  $\cdot 5 \times \cdot 33$  mm.

Thus from the studies of Hoek and Aurivillius we now know 7 members of the genus, namely: *stroemii*, *triangulare*, *septentrionale*, *erosum*, *obesum*, *cornutum*, *prunulum*, and possibly also *stearnsi*, which develop from the egg up to the *Cypris*-stage within the capitulum of the mother. The evidence is not complete or direct in every case, but the doubtful cases become almost certainties by analogy when we turn to the evidence derived from the "Pieter Faure" collection.

Summarising the results detailed under each species in the Systematic part of this paper, we find that there are 17 species in the South African fauna (*rutilum* is excluded as it is not contained in the collection), in 12 of which the *Cypris*-larva has been found within the ♀ capitulum. In one other species the larvae were in an early *Metanauplius* stage. In two species only the ova were found and two others were nonovigerous.

The following list gives the species with their bathymetrical range and the latest larval stage which was found within the mantle cavity. Where no ova or larvae were found both columns are left blank.

1. <i>valvulifer</i> Annand	.	.	.	22-87 fathoms.	<i>Cypris</i> .
2. <i>ornatum</i> (Gray)	.	.	.	36-85 "	"
3. <i>faurei</i> n. sp.	.	.	.	70-95 "	"
4. <i>cancellatum</i> n. sp.	.	.	.	200-250 "	"
5. <i>subalatum</i> n. sp.	.	.	.	51-200 "	"
6. <i>capense</i> n. sp.	.	.	.	95-136 "	"
7. <i>agulhense</i> n. sp.	.	.	.	250-256 "	Ova.

8. <i>brachium-cancræ</i> Welt.	.	.	105	fathoms.	Cypris.
9. <i>porcellanum</i> n. sp.	.	.	.	..	..
10. <i>brevicaulis</i> n. sp.	.	.	36	fathoms.	Cypris.
11. <i>eumitos</i> n. sp.	.	.	51-230	„	„
12. <i>uncinatum</i> n. sp.	.	.	36-92	„	„
13. <i>natalense</i> n. sp.	.	.	79	„	„
14. <i>sinuatum</i> Pilsbry	.	.	800-1000	„	Ova.
15. <i>botellinae</i> n. sp.	.	.	47-54	„	Cypris.
16. <i>micrum</i> Pilsbry	.	.	400-450	„	Early Metanauplius.
17. <i>imperfectum</i> Pilsbry	.	.	.	..	..

Firstly, this list shows that there is no difference in the life-history of shallow- and deep-water species. *Cypris*-larvae are found in e.g. *valvulifer* from 22 fathoms as well as in *cancellatum* from 250 fathoms.

Secondly, from a study of the whole material it was found that the number of ova or embryos was always very small, compared with the vast number produced by the *Lepadidae*. This number never exceeded 45. Aurivillius' term, "numerous," may well be taken to mean 50 or thereabouts. Hoek records 53 ova in *gracile*. The smallest numbers I have found were 8 in *brevicaulis* and 9 in *botellinae*. In the latter case they were fully developed *Cypris*-larvae, so that some may have already escaped, although I think the more likely explanation is that the larvae are so large compared with the mother that a greater number could not be accommodated. In the case of *brevicaulis* the *Cypris*-larvae are not quite fully developed, nor are they so large proportionately as in *botellinae*, so that the question arises whether all the members of a brood develop equally fast or whether some get ahead of their fellows and pass out of the mother. The latter occurs in *ornatum*; but no evidence of a similar occurrence in *valvulifer* could be found.

Thirdly, the ova are very much larger than those produced by the *Lepadidae*, as noted by Darwin in *vulgare*.

There seems to be no particular breeding season, specimens containing *Cypris*-larvae having been collected in nearly every month. This applies collectively; the material not being extensive enough to determine whether particular *species* breed at certain definite times of year.

The present collection, as stated above, has enabled me to prove the presence of a *Cypris*-larva within the capitulum in 12 out of 17 species inhabiting these waters, *i.e.* 70 per cent. If one includes also those species in which ova or *Metanauplii* were found, on the grounds of large size and small number, the percentage rises to 88.2. These results are entirely due to the fact that the "Pieter Faure" worked

over more or less the same ground month after month for several years. It shows the value of such methods in the investigation of a marine fauna.

It is, therefore, not a little surprising that Aurivillius found the *Cypris*-stage in 3 and the *Metanauplius* in 2 out of the 12 species of *Scalpellum* s. str. which he studied. And this material was collected by various collectors, at various times, and in widely separated localities. It suggests that the collections in other museums are well worth examining with regard to this particular point.

Thus it seems almost incredible that out of some 80 specimens, belonging to 35 species, the 2 discovered by Hoek are the only ones containing ova or larvae. Yet, since Hoek examined the internal anatomy in those cases where he had more than one specimen of the species, we must regard it as a mere chance that he found ova in only two cases.

Where a species was represented by only a single specimen, Hoek was actuated by the perfectly intelligible motive of not wishing to spoil the specimen. I submit, however, that this is a wrong principle in scientific investigation, especially where much information can be gained without in reality damaging the specimen. In the particular case of the pedunculate barnacles the whole of the animal within the capitulum, the male and the ova, or embryos, if any, can be extracted by merely removing the scutum from one side. As the whole of the other side is left intact and the capitulum is not removed from the peduncle, I cannot see that such a specimen is irretrievably damaged or has been "sacrificed" to investigation. In the course of the present study, when the *Cypris*-larva was found in the first specimen opened I have not opened any others in order to find other stages. In other cases it was necessary to open several or even all the specimens before one containing *Cypris*-larvae was found.

Of the life-histories of the species discovered by other expeditions also we are ignorant. In fact, out of more than 200 species comprising the genus, we know the life-history of scarcely two dozen, including the South African species. And in the case of some of these, we must remember there is no absolutely direct proof that the free-swimming stage is omitted; they are included on grounds of analogy on account of containing a small number of rather large ova.

Nevertheless, from the study of the South African collection, I think there is very strong presumptive evidence that in the majority, at least, of the species in this genus development takes place within the capitulum of the ♀ up to the *Cypris*-stage.

As noted at the beginning, the genus *Smilium* does not come within the scope of this discussion. It may, however, be mentioned that in *S. pollicipedoides* a coherent mass of numerous and relatively small eggs is found, and in *S. squamuliferum* Annandale has recorded that the eggs cohere together into a mass which is held in position by two dorsal processes analogous to the ovigerous frena in the *Lepadidae* (1906, in Herdman's Ceylon Pearl Fish. Suppl. Rep., 31, p. 142; and Illustrations Zool., "Investigator," 1906, pl. ii, fig. 4). Thus in all probability the life-history in this genus includes a free-swimming stage.

The only other known cases of the suppression of the free-swimming stage among the *Cirripedia* are in the aberrant Ascothoracic genera *Laura* and *Dendrogaster*, the Acrothoracic genus *Cryptophialus*, and the Rhizocephalid *Thompsonia*. The life-history of *Cryptophialus* was known to Darwin (Monogr., ii, pp. 102, 579).

Presuming that the life-history runs nearly the same course in all the species of *Scalpellum*, we can draw up from the stages we know the following composite picture of the life-history.

The ova are much larger and less numerous than in the *Lepadidae*. They pass through the *Nauplius* and *Metanauplius* stages and become typical *Cypris*-larvae within the capitulum of the mother. The *Nauplius* and *Metanauplius* stages are of very transient duration; in fact there is no true *Metanauplius*, and possibly no true *Nauplius* stage, because the cirri appear to be developed as soon as the anterior appendages (cf. *micrum*). Soon after the development of the cirri, the bivalve shell takes form. When this is complete and the larva has attained the typical *Cypris* structure, the egg-membrane or chorion is thrown off (cf. *brevicaulis* and *eumitos*).

Aurivillius thinks that the liberated *Cypris*-larva has but limited means of progression, and Hoek (1907) is inclined to believe that they merely creep out and take up a position either on or near by the mother. The South African material affords no conclusive evidence on this point.

After the attachment of the *Cypris*-larva, the *Cypris*-shell is not thrown off until the primordial valves of the terga, scuta, and carina have been formed (cf. *eumitos*). When this casting off actually occurs we do not know. But in *eumitos* it is before the full complement of valves has been developed, the rostral latera being absent.

The first peduncular plates appear (after casting off the *Cypris*-shell?) on the carinal side and are in *valvulifer*, *eumitos*, and *stearnsi*, four in number. Later plates are interpolated between these and the capitulum.

As to the order of appearance of the capitular valves we have very little evidence. In *eumitos* a recently attached *Cypris*-larva shows, besides the primordial valves, the carinal and upper latera and also the incipient inframedian latera. After the casting off of the *Cypris*-shell and the extension of the valves so as to encase the animal almost completely, the rostral latera (and rostrum ?) are developed. Trustworthy corroborative evidence was not found in *valvulifer* as there was no specimen in just that particular stage.

Comparing this sequence with that found in the allied genus *Smilium*: in South African specimens of *pollicipedoides* it was found that the inframedian latus was the last to appear. It will also be remembered that in *Scalpellum* proper it is the inframedian latus which is most variable and which tends in several species to disappear. The interpretation of these isolated facts must be left until we possess more information.

Stewart's paper on the post-larval development may also be consulted (1911, Mem. Ind. Mus., vol. iii, No. 2), although he deals mainly with the internal anatomy (reproductive organs) and only incidentally with the growth of the valves (cf. pp. 37, 38, pl. iv, figs. 2 and 5). Also Broch, Vidensk. Medd. naturh. For., vol. lxxiii, 1922.

[Note.—Since the above remarks were written in 1916, Nilsson-Cantell has published (Cirripeden-Studien Zoolog. Bidrag. fr. Uppsala, vol. vii, 1921) an important paper, one section of which deals with larval forms and the abbreviated life-history. He confirms the presence of the nauplius stage in *Scalpellum scalpellum* (= *vulgare*), but gives reasons for believing that under normal conditions the nauplius probably does not become free-swimming. He also finds *Metanauplius* and *Cypris*-stages within the mantle-cavity of the following species: *gibberum* Auriv., *convexum* Nils.-Cant., *compactum* Borrad., and *ventricosum* Hoek. He notes that the cause of this abbreviation in development cannot be attributed to the bathymetrical or temperature factors in the environment.

Nilsson-Cantell's results are very valuable as they confirm my own observations. We now know of 24 species in which the *Cypris* (or *Metanauplius*) has been found within the capitulum of the ♀. Although this is a very small percentage of the known species, nevertheless I am more strongly than ever convinced that if the material in the various museums and institutions were properly examined, the proof would be forthcoming that the normal course of larval development in the genus *Scalpellum* is intracapitular and not pelagic.

Nilsson-Cantell further has made the interesting discovery of an

abbreviated life-history in the sessile barnacle *Tetracrita divisa* Nils.-Cant., a tropical species living in the littoral zone.

This does not appear to be the case with the S. African species *serrata*. The ova are relatively minute and are produced in very large numbers; consequently it may be presumed that they do not develop further than the nauplius stage within the capitulum.]

## II. SYSTEMATIC PART.

### THORACICA.

#### PEDUNCULATA.

##### *Key to the South African families.*

1. Peduncle scaly. A basal whorl of plates below the principal 5.  
Umbo of scutum above the middle of the occludent margin . . . *Scalpellidae*.
2. Peduncle naked.
  - a. Valves 3-5 (sometimes reduced). Umbo of scutum at or near rostral angle . . . . . *Lepadidae*.
  - b. Valves wanting or greatly reduced, inconspicuous. Umbo of scutum, when present, in middle of occludent margin . . . *Alepadidae*.

#### Fam. SCALPELLIDAE.

1851. *Lepadidae* (part). Darwin, Monogr. Lepadid., p. 8.

1905. *Polyaspididae*. Gruvel, Monogr. Cirrip., p. 16.

1907. *Scalpellinae* (subfam.). Pilsbry, Bull. U.S. Nat. Mus., No. 60, pp. 3, 4.

1909. *Pollicipedidae*. Annandale, Mem. Ind. Mus., vol. ii, No. 2, p. 63.

1911. *Scalpellidae*. Krüger, Abh. K. Bay. Ak. Wiss. II. Suppl., Bd. 6, Abh., p. 7. (Hereafter cited as Beitr. Cirrip. Ostas.)

1922. *Scalpellidae*. Broch, Vidensk. Medd. naturh. For., vol. lxxiii, p. 227. See also Pilsbry, Pr. Ac. Philad., vol. ix, p. 104, 1908.

In Ann. Mus. Marseille, vol. xv, 1916, p. 37, Joleaud has proposed a classification of the genus *Scalpellum* which seems to offer certain advantages over previous attempts. It is based on a study of the evolutionary tendencies in the growth and atrophy of the valves. The genus or subgenus *Calantica* Gray has been removed altogether from *Scalpellum*, and is made a subgenus of *Pollicipes*. As no species of *Calantica* occurs in S. Africa this grouping need not be discussed here.

Gray's other genus, *Smilium*, is made a subgenus of *Scalpellum*, as in Pilsbry's 1907 arrangement, but under Hoek's name of *Protoscalpellum*.

In 1908 Pilsbry, rightly as it seems to me, resurrected *Smilium* as a separate genus distinguished on the one hand from *Calantica* by the elevation of the upper latera (M 2 of Joleaud) above the basal whorl, and on the other hand from *Scalpellum* on account of the structure of the male. Further, he separated off from *Smilium* those species in which the male has only 3 valves and a capitulum scarcely differentiated from the peduncle as *Euscalpellum* Hoek.

Joleaud regards these species as forming a section of *Protoscalpellum* under the term *Pseudoscalpellum*. He reinstitutes the term *Euscalpellum* very unfortunately, and, one might say, not a little unkindly towards Hoek, for an entirely different group representing the phyletically most advanced true *Scalpellums*.

There is no doubt that Pilsbry's method of making the male do its share in constructing a phyletic grouping as well as the hermaphrodite is scientifically sound. Even when the hermaphrodites alone are considered, there are good reasons for separating off *Euscalpellum* Hoek.

If regarded as a genus, *Smilium* must, of course, take precedence over *Protoscalpellum*.

### Key to the South African genera.

1. Valves more than 8. Peduncle not ending below in a calcareous cup or row of discs.
  - a. Female or hermaphrodite with 15 valves (exceptionally 9). Subcarina present. Male with 6 well-developed valves and distinctly divided into capitulum and peduncle . . . . . *Smilium*.
  - b. Female or hermaphrodite with not more than 14 plates. Subcarina absent. Male sac-like, not divided into capitulum and peduncle, without mouth or cirri, valves minute or wanting . . . *Scalpellum*.
2. Valves never more than 8, rostrum and latera small, rudimentary or even absent. Peduncle ending below in a cup or a row of disks. Corallidomous . . . . . *Lithotrya*.

### = Gen. SMILIUM Gray.

1825. *Smilium*. Gray, Ann. Philos. N.S., vol. x, p. 100.  
 1851. *Scalpellum* (part). Darwin, Monogr. Lepadid., p. 215.  
 1905. „ (part). Gruvel, Monogr. Cirrip., p. 23.  
 1907. *Protoscalpellum*. Hoek, Siboga. Exp. Monogr., 31A, p. 58.  
 1907. *Smilium*. Pilsbry, Bull. U.S. Nat. Mus., No. 60, p. 13.

1908. *Smilium*. Pilsbry, Proc. Ac. Sci. Philad., vol. lx, pp. 106, 107.  
 1909. „ Annandale, Rec. Ind. Mus., vol. iii, pt. 3, p. 267.  
 1910. „ Annandale, *ibid.*, vol. v, pt. 3, p. 145.  
 1910. „ Annandale, Vidensk. Medd. Natur. For. Kbhvn.,  
 1910, p. 211.  
 1911. „ Annandale, Tr. N. Zeal. Inst., vol. xliii, p. 164.  
 1911. „ Annandale, Ann. Mag. Nat. Hist. (8) 7, p. 589.  
 1911. „ Krüger, Beitr. Cirrip. Ostas., p. 15.  
 1912. „ Pilsbry, Proc. U.S. Nat. Mus., vol. xlii, p. 291.  
 1914. „ Annandale, Rec. Ind. Mus., vol. x, pt. 5, p. 273.  
 1916. *Protoscalpellum*. Joleaud, Ann. Mus. Marseille, vol. xv, p. 40.  
 1922. *Smilium*. Broch, Vidensk. Medd. naturh. For., vol. lxxiii,  
 p. 234.

*Key to the South African species.*

1. Valves 15. Upper latus well developed . . . . *pollicipedoides* Hk.
2. Valves 9. Upper latus quite rudimentary, or absent . . . *hypocrites* n. sp.

*Smilium pollicipedoides* (Hoek).

1905. *Scalpellum pollicipedoides*. Hoek, P. Ak. Amsterd., vol. vii, p. 92, figs. 4–6 (not described).

1907. *Scalpellum pollicipedoides*. Hoek, Siboga. Exp. Monogr., 31a, p. 60, pl. v, figs. 9–11.

1908. *Smilium pollicipedoides*. Pilsbry, Proc. Ac. Nat. Sci. Philad., vol. lx, p. 107.

The resemblance of the South African specimens to the typical East Indian specimens is so close that only the few slight differences need be pointed out.

The upper latus has 2 divergent ridges, varying in distinctness, running from the umbo to the basal margin, which is slightly concave for the greater part of its length. The scales on the peduncle are more numerous and closer together in the larger, but not in the smaller specimens. The carina is less strongly indented when viewed in profile. In size they are much larger than Hoek's specimens.

Some of the specimens of A 323 (numbered separately A 4111) have the rostral latera, carinal latera, and inframedian latera more or less directed outwards; and in one specimen the inframedian latus on one side is strongly recurved downwards. This seems to show that *pollicipedoides* is closely related to *S. scorpiis* Auriv., 1894.

*Aberration.*—One specimen of No. A 323, capitulum length 5 mm., is deep orange-brown all over, and, except for a few scales at the base of the peduncle, appears to have no calcareous scales or valves at all. The limits of the valves can be distinguished, and dissection revealed the presence of very thin pellucid chitinous valves.

*Male.*—No. A 3928, capitulum length 7 mm., contained one specimen, similar in general shape to that figured by Hoek, but larger: .9 mm.  $\times$  .7 mm. Two of the largest specimens of No. A323 also contained males, 2 in 1, 1 in the other. These are proportionately narrower, .9 mm.  $\times$  .5 mm., having the greatest width across the valves, thence narrowing regularly to the point of attachment. In size and shape the valves closely correspond with Hoek's description and figure, especially those of No. A 3928. The outer surface of the peduncular portion is covered with extremely minute spinules.

No frena or dorsal processes were found. No males were found in specimens with a capitulum length less than 7 mm.

Ova in an undifferentiated stage, measuring .2 mm., and numbering at least 150, were found in some specimens. They cohere together and form a compact mass at the bottom of the mantle cavity.

*Length* of capitulum, 1.5–12 mm.; of peduncle, 1–10 mm.

*Colour.*—In spirit, valves white or pinkish; membrane covering the peduncle and between the valves pale or (No. A 323) deep orange-brown, the membrane over the valves also orange coloured but paler.

*Locality.*—Durnford Point, N.E. by E., distant 9 miles (Zululand), 13 fathoms, 16 specimens; O'Neill Peak, N.W.  $\frac{1}{4}$  W., distant 9 miles (Zululand), 90 fathoms, 1 specimen; Itongazi River, N.W.  $\frac{3}{4}$  W., distant 3 miles (Natal), 25 fathoms, 1 specimen attached to a *Balanus trigonus* growing on the base of a horny sponge; Durnford Point, N., distant 12 miles (Zululand), 34 fathoms, 4 specimens on a Hydroid. S.S. "Pieter Faure," 8/2/01, 28/2/01, 14/3/01, and 28/2/01. (S.A.M., Nos. A 323, A 324, A 3928, and A 4089.)

*Geogr. Distribution.*—5° 28' S., 134° 53' E., 57 metres. (Hoek.)

The series shows that the inframedian latus does not appear until the capitulum has reached a length of about 4 mm. Hoek has described a specimen which has 2 additional valves in the lower whorl and which he regards as a reversion to the phylogenetically older *Mitella* (*Pollicipes*) type. In the genus *Scalpellum*, as noticed below, a certain group shows a strong tendency towards the reduction and elimination of this inframedian valve. I will not venture to discuss these points here, since to do so adequately would require

more knowledge of the post-embryological stages in the *Scalpellidae* than we yet possess.

*Smilium hypocrites* n. sp.

(Plate I, figs. 1, 2.)

Capitulum with 9 (11) valves, partly reduced and thus not closely fitting, covered with a fine membrane, smooth, lines of growth faintly visible; occludent margin concave, carinal margin gently convex.

Scutum pyriform, occludent margin slightly concave, inner margin nearly straight passing imperceptibly into the rounded basal margin, umbo at the acute apex.

Tergum narrow triangular, occludent margin very short, about  $\frac{1}{3}$  length of carinal margin, umbo at the subacute apex.

Carina longer than tergum, its apical umbo projecting slightly beyond that of tergum, very slightly bowed, base square, roof convex.

Subcarina broadly triangular, a little wider than high, not concealing base of carina.

A much reduced, crescentic valve, its curve corresponding with that of the inner basal margin of scutum, probably represents the carinal latus. An inframedian latus is therefore absent.

In some specimens there is at the upper end of the carinal latus a minute granule representing apparently the upper latus.

Rostrum much wider than high, extending laterally to about the middle of basal margin of scutum.

Peduncle half as long again as capitulum, with a few incomplete and irregularly developed rings of minute granules at its upper end, lower end quite naked. These granules vary considerably in development, being sometimes nearly wholly absent, but never strongly enough developed to form a protective armour to the peduncle; those on the carinal side are always slightly larger and more numerous than those on the lateral parts, and the rostral side is always entirely free from them, being opposed to the object to which the animal is fixed.

Labrum blunt, scarcely at all produced.

Mandible with 3 teeth, 1st further from 2nd than 2nd from 3rd, an accessory tooth between 1st and 2nd and between 2nd and 3rd, inner angle obtuse, bifid in one of the mandibles, denticulate in both.

Maxilla, outer angle with 1 large stout spine, inner edge straight with ca. 12 smaller spines.

Outer maxilla ovate, not strongly setose.

Labial palp rather short and stout, apex subacute, with a small tuft of setae.

First cirrus, the 6th jointed, posterior ramus slightly longer than the 5-jointed anterior ramus, neither ramus expanded.

Each joint of the other cirri with 2 pairs of long setae and a shorter pair near the base.

Caudal appendages short, broadly oval, apical margin rounded, fringed, with setae.

Penis  $\frac{1}{3}$  length of 6th cirrus, rather stout, tapering gradually, without setae except a few on the distal portion, apex subacute with a tuft of setules.

No frena or dorsal processes were found.

No complementary males could be found in any of the twenty specimens examined. As only the one set of specimens was taken, it is probable that males are only developed at certain times.

Some of the specimens were ovigerous, but in every case the ova were in an undifferentiated condition and not very well preserved. The number was small, between 20 and 30, size .2 mm.

*Length* of capitulum, 4 mm.; of peduncle, 5-6 mm. *Breadth*, 2 mm.

*Colour*.—In spirit, valves white, peduncle and spaces between the valves yellowish-brown.

*Locality*.—Durnford Point, N.W.  $\frac{3}{4}$  W., distant 12 miles (Zululand), 90 fathoms. Many specimens on *Villogorgia mauritiensis*. S.S. "Pieter Faure," 28/2/01. (S.A.M., No. A 4110.)

The specimens are completely overgrown by the coenenchyma and polyps, just as if they were the horny axis of the Gorgonian itself. Consequently they are extremely difficult to distinguish from the short branches of the latter. In fact it was only by an accident, while removing some sessile barnacles, that I became aware of them. After that I searched carefully all the *Gorgonaceae* in the collection, but failed to find any further specimens either on the other specimens of *Villogorgia* or on any other forms.

To the protection afforded by the spicules of the Gorgonian is evidently to be ascribed the reduction in the number and size of the valves and scales.

Although there is no proper upper latus here between the scutum and carina unless the minute "pin-point" valve, noticed above as being occasionally present, be regarded as its representative, I think there is no doubt that this species is a true *Smilium* in process of simplification owing to its protected habitat. It confirms the views of Hoek (*loc. cit.*, 1907, p. 63) and Pilsbry (*loc. cit.*, 1908, p. 109) that there is an inherent tendency in the scalpelliform barnacles towards reduction of the valves. Hoek considers *Mitella* (*Pollicipes*), with

many plates, older than *Scalpellum* with fewer; and Pilsbry notes in the subgen. *Arcoscalpellum* the frequent reduction of the inframedian latus (see also remarks on phylogeny in Broch, Vidensk. Medd. naturh. For., vol. lxxiii, 1922).

Gen. SCALPELLUM Leach.

1817. *Scalpellum*. Leach, Journ. de Physique, vol. lxxxv, p. 68.  
 1851. „ Darwin, Monogr. Lepadid., p. 215.  
 1883. „ Hoek, Challeng. Rep., vol. viii, p. 59.  
 1894. „ Aurivillius, K. Sv. Vet. Ak. Handl., vol. xxvi,  
     No. 7.  
 1905. „ Gruvel, Monogr. Cirrip., p. 23.  
 1905. „ Annandale, Mem. As. Soc. Beng., vol. i, pt. 5,  
     p. 75.  
 1906. „ Annandale, Ann. Mag. Nat. Hist., ser. 7,  
     vol. xvii, p. 390.  
 1906. „ Gruvel, Bull. Mus. d'Hist. Nat. Paris, v, p. 271.  
 1907. „ Gruvel, Bull. Soc. Zool. Fr., vol. xxxii, No. 5-6,  
     p. 158.  
 1907. „ Hoek, Siboga. Exp. Monogr., 31A, p. 54.  
 1907. „ Pilsbry, Bull. Bur. Fish., vol. xxvi, p. 181.  
 1907. „ Pilsbry, Bull. U.S. Nat. Mus., No. 60, pp. 6, 13.  
 1911. „ Pilsbry, Bull. Bur. Fish., vol. xxix, p. 61.  
 1911. „ Krüger, Beitr. Cirrip. Ostas, p. 18.  
 1912. „ Gruvel, Bull. Inst. Oc. Monaco, No. 241, p. 1.  
 1913. „ Annandale, Rec. Ind. Mus., vol. ix, pt. 4, p. 227.

Only the chief references are given above; others will be found below where a comparison of the South African forms with extra-African forms is necessary.

The following arrangement of the species is purely artificial and in nowise phyletic:—

*Key to the South African species.*

I. Valves perfectly calcified.

A. Umbo of inframedian latus at base.

1. Roof of carina convex.

a. Carina angularly bent, umbo remote from apex.

i. Upper latus quadrangular. Adult with accessory valves

*valvulifer* Annand.

ii. Upper latus quadrant-shaped, incised . . . *ornatum* (Gray).

iii. Upper latus triangular . . . *faurei* n. sp.

- b. Carina simply arched, umbo apical or sub-apical.
    - i. Upper latus triangular, not incised, valves cancellate  
*cancellatum* n. sp.
    - ii. Upper latus quadrant-shaped, more or less incised.
      - a. Carinal margin of carinal latus reflexed outwards  
*subalatum* n. sp.
      - β. Carinal margin not reflexed.
        - \* Carinal margin of carinal latus ridge-like, thickened.  
Valves striate . . . . . *capense* n. sp.
        - \*\* Carinal margin not thickened. Valves smooth  
*agulhense* n. sp.
  - 2. Roof of carina flat, square in section.
    - a. Tergum scarcely projecting above apex of carina  
*brachium-cancrī*, Welt.
    - b. Tergum strongly projecting . . . . . *porcellanum* n. sp.
  - 3. Roof of carina bordered by more or less prominent ribs.
    - a. Rostral latus low.
      - i. Upper latus not longer than broad.
        - α. Capitulum and peduncle smooth . . . *brevicaulis* n. sp.
        - β. Capitulum and peduncle setose . . . *eumitos* n. sp.
      - ii. Upper latus longer than broad . . . . \* *rutilum* Darw.
    - b. Rostral latus high.
      - i. Rostrum very short . . . . . *uncinatum* n. sp.
      - ii. Rostrum long . . . . . *natalense* n. sp.
  - B. Umbo of inframedian latus at or near the middle . *sinuatum* Pilsbry.
  - C. Umbo at the more or less acute apex.
    - 1. Rostral latus low . . . . . *botellinae* n. sp.
    - 2. Rostral latus high . . . . . *micrum* Pilsbry.
- II. Valves imperfectly calcified (*Mesoscalpellum*) . . . *imperfectum* Pilsbry.

*Scalpellum valvulifer* Annand.

*Scalpellum darwini*. Steenstrup MS. (name now preocc.).

1910. *Scalpellum valvulifer*. Annandale, Vidensk. Medd. Naturf. For. Kbhvn., 1910, p. 214, pl. 3, figs. 1, 2.

The mandible sometimes has only 2 teeth besides the inner angle, which is not often merely bifid but has several minute denticles. Maxilla with the inner edge straight and scarcely any trace of a notch. Caudal appendages slender, as long as peduncle of 6th cirrus, tipped with 2 groups of 2-3 setae. Penis absent.

In other respects there is nothing to add to Annandale's description except that here the rostrum is perfectly visible and not at all concealed by the rostral latera.

\* Species preceded by an asterisk are not represented in the S. African Museum collections.

Annandale says that "the valvules appear to be split off from the valves rather than to arise from separate centres of calcification." From an examination of cleared and mounted preparations I find that the valvules do arise from separate centres of calcification, although I would not deny that they may sometimes originate by splitting off. Owing to mutual pressure their margins are bound to correspond with those of the valves, and, consequently, the appearance of "splitting off" is produced. I have not been able to discover a single clear instance of splitting off, whereas in the membrane between two valves, the valvules, in different stages of growth, down to microscopic pin-points in size, can be easily discerned, and the centre of calcification is always midway between the 2 valves. The umbo of a valvule is thus central and growth proceeds concentrically. The production of secondary and tertiary sets of valvules proceeds on similar lines.

*Male*.—One in a pouch under each scutum. Females with a capitulum length under 3.5 mm. did not contain any males, though the beginnings of the pouches were visible. Oval, .5 mm.  $\times$  .3 mm., surface extremely minutely spinulose. Antennae very distinct, as also 2 or 3 sets of muscle strands crossing the walls. No internal structure visible other than the testis. Apex turned at right angles to the plane of the rest of the body, *i.e.* projecting inwards from the scutum, with 4 small oval, subequal valvules.

*Length* of capitulum, 6 mm.; of peduncle, 4 mm. *Breadth*, 3 mm.

*Colour*.—In spirit, valves white, intervening membrane pale brownish.

*Locality*.—Walker Point, N.E. by N.  $\frac{1}{2}$  N., distant 7 miles, 47 fathoms, many specimens; Rockland Point, N.W. by W.  $\frac{1}{2}$  W., distant 1 mile (False Bay), 22 fathoms, 3 specimens; St. Francis Bay, 26 fathoms, 1 specimen; Knysna Head, N., distant 10 miles, 52 fathoms, several specimens; Cape Seal, W. by N.  $\frac{1}{2}$  N., distant 7 miles, 39 fathoms, several specimens; off Nanquas Peak (Algoa Bay), 40 fathoms, several specimens; Cape Point, N.W. by W.  $\frac{3}{4}$  W., distant  $2\frac{1}{2}$  miles, 42 fathoms, 1 specimen; Duminy Point (off Saldanha Bay), E. by N.  $\frac{1}{2}$  N., distant 8 miles, 87 fathoms, 5 specimens. S.S. "Pieter Faure," 11/10/00, 24/9/02, 2/3/99, 2/7/02, 20/4/06, 29/3/04, 6/6/00, and 17/3/02. (S.A.M., Nos. A 307, A 303, A 3908, A 4090, A 4091-2-3, and A 4311 respectively.)

*Geogr. Distribution*.—China Sea. (Annandale.)

All the specimens are attached to worm-tubes, usually segregated in large numbers. They appear to monopolise the situation, as no

other barnacles are fixed to these worm-tubes. The tubes of No. A 307 are several centimetres long, but scarcely 2 mm. in diameter, composed of a tough horny substance, externally iridescent, perhaps belonging to some species of *Chaetopterid*; other tubes are those of *Telepsavus costarum*, also a *Chaetopterid*.

The following outline of the life-history has been pieced together from a study of the numerous specimens of No. A 307. Although there are a large number of small, medium, and large-sized individuals, there are very few of the smallest size showing the very early changes. There are also only a few recently attached *Cypris*-larvae.

Ova, *Metanauplius* and *Cypris*-larvae, were all found within the mantle cavity in various individuals. A brood seems never to exceed 30 in number, all the individuals of which appear to develop at the same rate. No case of ova and *Cypris*-larvae in the same capitulum was discovered.

The ova are oval,  $\cdot 5 \times \cdot 3$  mm.

The *Metanauplius* measures  $\cdot 75 \times \cdot 4$  mm.

The *Cypris*-larva is of about the same size as the *Metanauplius* and pale brown (preserved) in colour.

I was unable to find any *Cypris*-larva showing, while still within the mother, the primordial valves. It may be, therefore, that these are developed after the escape of the *Cypris* from the parental capitulum.

A few recently attached *Cypris*-larvae were found. Those destined to become females are attached to the worm-tubes; but the male *Cypris* attaches itself to the occludent margin of the scutum of specimens about 3 mm. in length. No difference in size or shape between ♂ and ♀ *Cypris* could be detected, such as Stewart (1911, Mem. Ind. Mus., vol iii, pt. 2, pp. 37, 38, pl. iv, figs. 1-4) has recorded in *S. squamuliferum*.

The earliest stage found, in which the beginnings of the valves are visible, measures in total length 1 mm. The *Cypris*-shell has just been cast off. The primordial valves have been extended beyond their original limits, the carinal and upper latera are distinct, and there are traces of the inframedian latera and rostrum.

Second stage (these stages do not, of course, necessarily correspond with the periods between successive ecdyses).—Capitular length,  $\cdot 9$  mm. All the valves present except the rostral latera, but on this point the specimen does not afford very clear evidence. Upper latera square. Inframedian latera oval. No peduncular plates.

Third stage.—Capitular length,  $\cdot 9-1$  mm. Four peduncular plates,

the 2 largest on the carinal side, 2 smaller lateral ones extending round and almost meeting below rostrum.

Fourth stage.—Capitular length, 1-2 mm. A second row of peduncular plates developed, consisting of 1 rostral, 1 carinal, and 1 on each side, thus alternating with the primary row. Upper latus with the lower margin differentiated into 2 facets abutting one against the inframedian, the other against the carinal latus. The former oblong, higher than wide. Primordial valve of tergum very prominent at this stage and projecting beyond the occludent margin.

Fifth stage.—Capitular length, 2.5 mm. By this time the valves have attained their normal shape, and several rows of peduncular plates have been developed. The primordial valve of the tergum has ceased to project owing to the extension of the occludent margin of the valve.

Sixth stage.—Capitular length, 3-3.5 mm. Specimens smaller than this do not contain males. But there are a few specimens of this size, each with a *Cypris*-larva attached to the occludent margin of the scutum.

Seventh stage.—Capitular length, 4.5 mm. The first series of valvules now begins to appear. Breeding also seems to begin at this stage, no ova or larvae being found in specimens of less size. Secondary and tertiary series of valvules are developed only in the largest specimens.

*Scalpellum ornatum* (Gray).

1848. *Thaliella ornata*. Gray, Proc. Zool. Soc. Lond., 1848, pt. 16, p. 44. (Annulosa plate.)

1851. *Scalpellum ornatum*. Darwin, Monogr. Cirrip., p. 244, pl. 6, fig. 1.

1910. „ „ Stebbing, Gen. Cat. S.A. Crust., p. 567.

Umbones of the rostral and carinal latera projecting only slightly beyond the profiles of rostrum and carina in all the specimens except those from Gordon's Bay. The ridges on the upper latus and carina vary, being in some very distinct, in others barely distinguishable.

Mouth-parts as described by Darwin. Anterior ramus of 1st cirrus very little shorter than posterior, both 6-jointed. Caudal appendages equal to width of peduncle of 6th cirrus, oval, with minute spinules on margins but no long spines on the blunt apex. (Darwin says there are 4 such spines.) No penis.

*Male*.—One in each scutal pouch. Oval,  $.75 \times .4$  mm.; surface very minutely spinulose, apex with 4 small oval valvules, 2 larger than the other 2, antennae as described by Darwin. Testis distinct, but there is no trace of the eye or any thoracic or abdominal appendages which Darwin says he found in a dried specimen. Either the preservation of the specimen led Darwin to a faulty observation, or, what seems more likely, he examined ♂♂ in which the degeneration of the appendages had not proceeded so far as in the present specimens. Hoek has observed and figured 3 stages of the ♂ of *velutinum* (1883, *Challeng. Rep.*, vol. viii, p. 98, pl. ix, figs. 7–9) showing this retrogression.

Larval forms: ova, *Metanauplii* and *Cypris*-larvae were found in some individuals within the mantle cavity. In one specimen, ova in an undifferentiated stage were found, together with a few *Cypris*-larvae. Size of *Cypris*-larva,  $.8 \times .4$  mm. Brood not exceeding 30 in number.

*Length* of capitulum, 6.5 mm.; of peduncle, 2.5 mm. *Breadth*, 4 mm.

*Colour*.—In spirit, white.

*Locality*.— $32^{\circ} 45'$  S.,  $28^{\circ} 26'$  E. (off Cape Morgan), 36 fathoms, 2 specimens on a Hydroid;  $33^{\circ} 6'$  S.,  $28^{\circ} 11'$  E. (off East London), 85 fathoms, 1 specimen on a Hydroid; Sandy Point, N.E. by N., distant 6 miles (off Cape Morgan), 51 fathoms, 1 specimen on a Hydroid; Cape Morgan, N.  $\frac{1}{2}$  W., distant 10 miles, 77 fathoms, 7 specimens on Hydroid; Cape St. Francis, N.E. by E., distant 32 miles, 74 fathoms, 1 on a Hydroid with *S. uncinatum*. S.S. "Pieter Faure," 12/1/99, 28/1/99, 14/8/01, 26/7/01, and 19/2/02 respectively. Also Gordon's Bay in False Bay, 10 fathoms. (S.A.M., Nos. A 3906, A 4085, A 4088, A 4049, A 4103, and A 4398.)

*Distribution*.—Algoa Bay. (Gray.)

*Aberration* (Plate I, fig. 3).—One specimen taken in the same haul, and on the same specimen of Hydroid as No. A 3906 above, presents a curious condition, and would undoubtedly have been considered a different species had it occurred by itself.

All the plates are like those of the typical *ornatum*, except the rostral and inframedian latera and the carina. This latter has the umbo quite apical although the apex reaches to the same point on the tergum as does the apex (not the umbo) in the typical form. The rostral latus is much larger, though of the normal shape, having grown inwards so far that its upper angle touches the upper latus and thus separates the scutum and inframedian latus. This latter valve has

diminished in width to accommodate the rostral latus, so that it is nearly 4 times as high as wide, umbo at the basi-rostral angle as in the normal *ornatum*.

This specimen may, of course, prove to belong to a separate species when more material is dredged, but for the present I prefer to place it here.

*Length* of capitulum, 5 mm. ; of peduncle, 2 mm. *Breadth*, 3 mm.

*Colour*.—In spirit, white.

*Locality*.—32° 45' S., 28° 26' E. (off Cape Morgan), 36 fathoms, 1 specimen on a Hydroid with typical *ornatum*. S.S. "Pieter Faure," 12/1/99. (S.A.M., No. A 322.)

*Scalpellum faurei* n. sp.

(Plate I, fig. 4.)

Capitulum subquadrangular, ocludent and carinal margins slightly convex, subparallel, with 13 or 14 closely fitting valves ; all the valves finely striate radiately, covered by a very fine cuticle sparsely clothed with short and very fine hairs.

Scutum trapezoidal, lateral margin straight.

Tergum, scutal margin longer than ocludent margin, acute, not recurved.

Upper latus triangular, tergal and scutal margins subequal, carinal margin slightly excavate at base for reception of the apex of carinal latus.

Carina not strongly arched below umbo, but here bent almost at right angles, intraparietes very prominent, faintly striate, roof convex, sides wide at base, rapidly narrowing towards umbo, 2 striae rather stronger than the others form slight dorso-lateral ridges from umbo but not reaching base.

Carinal latus triangular, umbo meeting its fellow below base of carina but not prominent, rostral margin concave.

Inframedian latus narrow, high, curved, umbo at base, widening slightly upwards, apex acute touching upper latus.

Rostral latus triangular, nostral margin short, scutal longer than basal margin, apex not touching upper latus.

Rostrum either absent or, if present, scarcely visible externally, minute, elongate oval, situate in middle of the suture between the rostral latera on the inside.

Peduncle short with 7 rows of 4–5 closely imbricated scales.

Labrum obtusely produced.

Mandible with 3 teeth, 1st more distant from 2nd than 2nd from 3rd, a few minute denticles on outer margin of 2nd and 3rd, inner angle subacute, denticulate.

Maxilla with a notch between the outer 4 unequal spines and the inner 6.

Outer maxilla ovate, setose.

First cirrus, the 7-jointed, posterior ramus a little longer than the 6-jointed anterior ramus, neither strongly expanded.

Each joint of the other cirri with 5 pairs of setae, increasing in length distally.

Caudal appendages half length of 6th cirrus, 1-jointed, tapering, apex subacute, setose.

No penis.

*Male*.—One in each scutal pouch. Oval,  $\cdot 5 \times \cdot 3$  mm.; surface extremely minutely spinulose, antennae nearly at inner end, apex with 4 valvules, the larger 2 oval, the smaller subcircular. A trace of the cirri can just be discerned.

Larvae in an early *Metanauplius* stage, showing the 1st antennae and rudiments of the cirri, but no trace of any other appendages; also in another specimen, *Cypris*-larvae,  $\cdot 75 \times \cdot 4$  mm., of typical structure. Both stages found within the mantle cavity, less than 20 in number.

*Length* of capitulum, 6 mm.; of peduncle, 2 mm. *Breadth*, 3 mm.

*Colour*.—In spirit, white.

*Locality*.—Cape Morgan, N.  $\frac{1}{2}$  W., distant 10 miles, 77 fathoms, 10 specimens on a dead Gorgonian stem and 1 juv. on a *Melitodes*-like Gorgonian; East London, N.  $\frac{3}{4}$  W., distant 14 miles, 70 fathoms, 2 juv. on *Villogorgia mauritiensis*; Sandy Point, N.  $\frac{1}{4}$  E., distant 10 miles (off Cape Morgan), 95 fathoms, 5 juv. on *Allopore nobilis*. S.S. "Pieter Faure," 26/7/01, 12/7/01, and 14/8/01. (S.A.M., Nos. A 4095 (the juv. specimen, A 4107), A 4106, and A 4299.)

Closely allied to *S. hoeki* Gruvel (1902, Tr. Linn. Soc. Lond., vol. viii, pt. 8, p. 290, pl. viii, figs. 6–9 and 16–20), but easily distinguished by the absence of ridges on the valves and the radiate direction of the striae, and by the rudimentary rostrum. Also the caudal appendages are here 1-jointed, not 3, as in Gruvel's species from the Pacific Ocean.

*Scalpellum cancellatum* n. sp.

(Plate I, fig. 5.)

Capitulum ovate, carinal margin much more convex than occludent, with 14 closely fitting valves covered by an extremely fine cuticle, all the valves with close set radiate and more widely separated concentric striae, giving a cancellate appearance.

Scutum trapezoidal, lateral margin straight, a slight ridge from umbo to basi-lateral angle.

Tergum, occludent margin nearly straight, scutal margin longer than occludent, apex acute.

Upper latus triangular, carinal margin slightly convex, not emarginate, scutal margin slightly raised, rib-like.

Carina simply arched, umbo apical at about middle of tergum, sides wide basally, base rounded, roof convex with slight median, submedian and lateral ribs.

Carinal latus triangular, umbo meeting its fellow below base of carina, carinal margin slightly thickened but not at all reflexed, rostral margin concave.

Inframedian latus narrow, linear, curved, umbo at base, almost under the basal margin of rostral latus; in one specimen there are 4 radiate striae, in the other only 2; apex truncate, meeting both upper latus and basi-lateral angle of scutum.

Rostral latus triangular, basal margin short, upper inner angle almost reaching upper latus, umbo slightly projecting, rostral margin very short.

Rostrum small but distinct, sublinear, slightly wider above.

Peduncle short, with 8 rows of 8-10 closely imbricated scales.

Labrum obtusely produced.

Mandible with 3 teeth decreasing in size, inner angle subacute, denticulate.

Maxilla, inner edge with a scarcely defined notch. Outer maxilla ovate, setose.

First cirrus, rami subequal, the anterior 6-jointed, the posterior 8-jointed, neither expanded.

Each joint of the other cirri with 4 pairs of long setae with a shorter pair below them.

Caudal appendages  $\frac{3}{4}$  length of peduncle of 6th cirrus, 3-jointed, setose.

No penis.

*Male*.—One in each scutal pouch. Oval-quadrangular,  $.5 \times .3$  mm.,

surface very minutely spinulose, antennae nearly at inner end, apex with 4 (2 larger than the other 2) oval, feebly calcified valvules, testis distinct, no trace of cirri.

*Cypris-larva*.—A small number in the mantle cavity, of typical structure, yellowish,  $.75 \times .5$  mm.

*Length* of capitulum, 6.5 mm.; of peduncle, 2 mm. *Breadth*, 3.75 mm.

*Colour*.—In spirit, white.

*Locality*.— $36^{\circ} 44' S.$ ,  $21^{\circ} 14' E.$ , 250 fathoms, 1 specimen on worm-tube with *S. agulhense*;  $36^{\circ} 40' S.$ ,  $21^{\circ} 26' E.$ , 200 fathoms, 1 specimen in a calcareous Polyzoan with *S. subalatum*. S.S. "Pieter Faure," 17/7/06 and 18/7/06. (S.A.M., Nos. A 3915 and A 4087.)

*Scalpellum subalatum* n. sp.

(Plate I, fig. 6.)

Capitulum lanceolate, stout at base, with 14 closely fitting valves covered by an extremely thin cuticle, all the valves radiately striate and marked with more widely distant concentric striae, these latter being best developed on the carina.

Scutum trapezoidal, occludent margin convex, lateral margin converging slightly at upper end, straight, a slight ridge from umbo to basi-lateral angle.

Tergum, occludent margin straight, shorter than scutal margin, apex acute.

Upper latus triangular, distinctly, though in a varying degree, notched at basal part of carinal margin for the reception of apex of carinal latus, 2 slight ridges from umbo to notch, one of them forming the scutal margin.

Carina extending half-way up tergum, simply but strongly arched, umbo subapical, sides narrow above, widening below, bordered by slight ribs, base rounded, quadrate, roof convex with median and submedian ribs.

Carinal latus triangular, rostral margin concave, carinal margin formed by a ridge which is strongly reflexed outwards.

Inframedian latus moderately wide at base, then strongly constricted, then again widening gradually to the quadrate apex, umbo at the base, projecting laterally downwards and outwards over the peduncle, separated from rostral latus by a wing-like expansion.

Rostral latus triangular, basal margin stout, umbo projecting, inner

apical angle widely separated from upper latus, rostral margin moderately short.

Rostrum linear-ovate, slightly wider at base.

Peduncle short, with 8 rows of 5 closely imbricated scales, the points of which are recurved outwards.

Labrum obtusely produced.

Mandible with 3 teeth decreasing in size, inner angle subacute, denticulate.

Maxilla with a small but distinct notch, outer spines 3, inner spines 7 in number.

Outer maxilla ovate, setose.

First cirrus, rami subequal; the anterior 7-, the posterior 8-jointed, both slightly expanded.

Each joint of the other cirri with 5 pairs of long setae and a pair of setules at base.

Caudal appendages  $\frac{1}{2}$  length of peduncle of 6th cirrus, 1-jointed, with 3-4 apical setae.

No penis.

*Male*.—One in each scutal pouch. Oval,  $\cdot 6 \times \cdot 4$  mm., surface minutely spinulose, antennae near inner end, apex without any trace of valvules, testis distinct, cirri just visible in one specimen but not in another.

*Cypris-larva*.—A small number in the mantle cavity, of typical structure, yellowish,  $\cdot 8 \times \cdot 5$  mm.

*Length* of capitulum, 5 mm.; of peduncle, 1.5 mm. *Breadth*, 3 mm.

*Colour*.—In spirit, white.

*Locality*.— $36^{\circ} 40'$  S.,  $21^{\circ} 26'$  E., 200 fathoms, 7 specimens on a calcareous Polyzoan with *S. cancellatum*; Great Fish Point, N.W., distant 9 miles, 57 fathoms, 4 specimens on a Polyzoan as above; Cape St. Francis, N.E. by E.  $\frac{1}{2}$  E., distant 36 miles, 70 fathoms, 4 specimens. S.S. "Pieter Faure," 17/7/06, 3/9/01, and 19/2/02. (S.A.M., Nos. A 3914, A 4097, A 4098.)

Closely allied to *S. capense*, the distinguishing features being mentioned under that species. Also allied to *cancellatum* and *agulhense*.

*Scalpellum capense* n. sp.

(Plate I, fig. 7.)

Capitulum oval, with 14 closely fitting valves, covered by a very fine cuticle, with short, moderately dense pile, all the valves rather

strongly striate radiately, with more widely separated concentric lines of growth.

Scutum trapezoidal, ocludent margin convex, lateral margin straight, apex acute, a slight ridge from umbo to basi-lateral angle.

Tergum, ocludent margin convex, shorter than scutal margin, apex subacute, slightly recurved, a slight ridge from umbo to carino-basal angle.

Upper latus subtriangular, with a notch in the middle of the carinal margin for the reception of the apex of carinal latus, 2 very slight ridges from umbo to notch.

Carina extending nearly  $\frac{3}{4}$  up the tergum, simply arched, umbo apical, base V-shaped, roof convex with median and submedian ribs, sides flat, widening moderately downwards and bordered by slight ribs.

Carinal latus triangular, as high as wide, rostral margin concave, carinal margin also concave, formed by a broad ridge which runs to the apex and narrows towards the umbo, which projects slightly and meets its fellow over the base of the carina.

Inframedian latus narrow, at least twice as high as the width of the upper part, narrowing below and curving under the rostral latus, umbo at base, not projecting.

Rostral latus triangular, lateral margin convex, scarcely any basal margin, rostral margin very short, umbo not projecting, inner apical angle nearly touching upper latus.

Rostrum very small, triangular, widest below.

Peduncle with 8 rows of 5-6 closely imbricated scales.

Labrum obtusely produced.

Mandible with 3 teeth decreasing in size, outer margin of 2nd and 3rd minutely denticulate, inner angle blunt, denticulate.

Maxilla with a gap, but not a notch, between the outer 4 unequal spines and the inner ones.

Outer maxilla broadly ovate, moderately setose.

First cirrus, the 8-jointed posterior ramus slightly longer than the 5-jointed anterior ramus, neither strongly expanded.

Each joint of the other cirri with 4 pairs of long setae and a pair of setules below them.

Caudal appendages  $\frac{3}{4}$  length of peduncle of 6th cirrus, incompletely divided into 3 joints, each apically setose.

No penis.

*Male*.—One in each scutal pouch. Oval,  $.6 \times .4$  mm., surface minutely spinulose, antennae near inner end, apex with 4 feebly

calcified, subequal oval valvules, testis distinct, remains of cirri just visible.

Seventeen ova, badly preserved, and in an undifferentiated stage.

*Cypris-larva*.—Fifteen of normal structure in the mantle cavity, yellowish,  $.7 \times .4$  mm.

*Length* of capitulum, 5 mm. ; of peduncle, 1.5 mm. *Breadth*, 3 mm.

*Colour*.—In spirit, white.

*Locality*.—Lion's Head, N.  $67^{\circ}$  E., distant 25 miles (off Cape Peninsula), 131–136 fathoms, 1 specimen ; Lion's Head, S.E., distant 22 miles, 10 specimens on Polyzoan. S.S. "Pieter Faure," 28/3/00 and 6/3/00. (S.A.M., Nos. A 4105 and A 4312.)

Near to *S. subalatatum*, but distinguished by the recurved tergal apex, the shape of the upper latus, and the curving of the non-projecting umbo of the inframedian latus under the rostral latus, instead of the projecting umbo being separated from the rostral latus by a wing-like expansion, as in *S. subalatatum*.

*Scalpellum agulhense* n. sp.

(Plate I, fig. 8.)

This species is so close to *hendersoni* Pilsbry (1911, Proc. Ac. Nat. Sci. Philad., vol. lxiii, p. 172, fig. 1), from Florida Strait, that only the differences need be pointed out.

The upper latus has the angle between its carinal and carino-lateral margins more obtuse, so that the latter margin is more oblique with the former margin and the valve appears more triangular. Also the margin opposing the inframedian latus is horizontal and the upper end of this latter valve is less angular. The roof of the carina is convex but tricarinate, 1 keel being median and 2 lateral ; they are quite distinct, but rounded, and very prominent. The cuticle is rather thickly hirsute.

The 5 specimens show little variation : the margin of the upper latus abutting against the carinal latus is distinctly concave in 2, nearly straight in the other 3 specimens ; in 3 the rostrum tapers below and does not reach the basal angles of the rostral latus, in the other 2 it is nearly linear and extends the whole length of the ventral margin of the rostral latus.

Labrum subacutely produced.

Mandible with 3 teeth, outer margin of 2nd and 3rd with a few minute denticles, inner angle subacute, denticulate.

Maxilla with a notch separating the outer 4 unequal spines from the inner 6-7.

Outer maxilla rather sparsely setose.

First cirrus, rami subequal, both 7-jointed, not strongly expanded. Each joint of the other cirri with 5 pairs of setae increasing in length distally.

Caudal appendages  $\frac{3}{4}$  length of peduncle of 6th cirrus, 1-jointed, tapering, apex subacute, setose.

No penis.

*Male*.—One in each scutal pouch. Oval,  $.7 \times .4$  mm.; surface very minutely spinulose, antennae nearly at inner end, apex with 4 small valvules, 2 larger than the other 2, a trace of the degenerating cirri still visible.

Fourteen ova in an undifferentiated stage in the mantle cavity.

*Length* of capitulum, 5.5 mm.; of peduncle, 2 mm. *Breadth*, 3 mm.

*Colour*.—In spirit, white.

*Locality*.— $36^{\circ} 44'$  S.,  $21^{\circ} 14'$  E., 250 fathoms, 4 specimens on an Annelid tube with *S. cancellatum*;  $34^{\circ} 27'$  S.,  $25^{\circ} 42'$  E. (off Cape Recife), 256 fathoms, 1 specimen on an Annelid tube. S.S. "Pieter Faure," 18/7/06 and 14/11/98. (S.A.M., Nos. A 3912 and A 4096.)

*Scalpellum brachium-cancræ* Welt.

(Plate I, fig. 10.)

1922. *Scalpellum brachium-cancræ*. Weltner, Wiss. Erg. Deutsch. Tiefsee Exp., vol. xxiii, pt. 2, p. 65, text-fig. 1, pl. ii, fig. 2.

Capitulum ovoid, apically rounded, with 14 slightly separated valves covered with an extremely fine cuticle, all the valves rather strongly striate radiately.

Scutum pentagonal, occludent margin slightly convex, lateral margin straight, apex acute, slightly recurved.

Tergum, occludent margin strongly convex, apex subacute, strongly recurved, not projecting much beyond carina.

Upper latus nearly rectangular, slightly wider than high, a rib slightly more prominent than the other striae, from umbo to basicarinal angle.

Carina simply and strongly arched, extending nearly to apex of tergum, umbo apical, sides narrow, at right angles to the roof, which is flat with a faint median rib, base quadrate.

Carinal latus triangular, umbo meeting its fellow below base of carina, but not prominent, basal and rostral margins subequal, the latter concave, apex rounded.

Inframedian latus curved, expanding upwards from an acute basal umbo, rostral margin concave, upper margin scalloped due to the striation.

Rostral latus small, basal and scutal margins subparallel, umbo not projecting.

Rostrum triangular, equilateral, widest at base.

Peduncle with 8 rows of 5 rather widely separated scales.

Labrum subacutely produced.

Mandible with 3 teeth, 1st far removed from and much larger than 2nd and 3rd, inner angle subacute, denticulate.

Maxilla with a notch separating the 3 outer unequal spines from the inner ones (ca. 10).

Outer maxilla oval, setose.

First cirrus, the 7-jointed posterior ramus longer than the 5-jointed anterior one, both rather strongly expanded and setose.

Each joint of the outer cirri with 4 pairs of long setae.

Caudal appendages nearly as long as peduncle of 6th cirrus, 1-jointed, with a thick apical tuft of setae.

No penis.

*Male*.—One in one of the scutal pouches, the other pouch empty. Oval,  $5 \times 3$  mm., surface very minutely spinulose, antennae near inner end, apex with 4 subequal small oval valvules, testis distinct, no trace of cirri.

*Cypris-larva*.—About 2 dozen in the mantle cavity, of typical structure, yellowish,  $75 \times 5$  mm.

The ♀ is preparing for another moult, as shown by the new cuticle within the old in the appendages.

*Length* of capitulum, 10 mm. ; of peduncle, 4 mm. *Breadth*, 6.5 mm.

*Colour*.—In spirit, valves white, intervening membrane pinkish.

*Locality*.—Cape St. Blaize, N. by E.  $\frac{1}{2}$  E., distant 68 miles, 105 fathoms, 1 specimen. S.S. "Pieter Faure," 21/2/02. (S.A.M., No. A 329.)

The "Pieter Faure" specimen is obviously identical with the "Valdivia" specimens described by Weltner. The plates, however, differ slightly in shape, and the scales of the peduncle are farther apart than in Weltner's figure. I have, therefore, thought it worth while to figure my specimen.

Weltner found his specimens on the backs of the crab *Scyramathia hertwigi* Dofl. captured on the Agulhas Bank at 250 fathoms. The S.A. Museum specimen is a detached specimen without any record as to the object on which it was found. I have examined all the

specimens of *Scyramathia* (and other crabs) in the museum collection, but have failed to find any more specimens.

It is curious to find barnacles on the back of *Scyramathia*, which seems to be invariably coated with a sponge (*Lissodendoryx*); and, indeed, the presence of this crab on the Agulhas Bank is exceptional. It was never taken east of Cape Point by the s.s. "Pieter Faure," but was found to be a characteristic species on the West coast.

*Scalpellum porcellanum* n. sp.

(Plate I, fig. 9.)

Capitulum ovate, both margins convex, with 14 closely fitting valves covered by an extremely thin cuticle, valves smooth or with very faint striae, growth-lines distinct.

Scutum trapezoidal, lateral margin straight, umbo slightly recurved.

Tergum large, triangular, occludent margin convex, shorter than the other margins, apex subacute.

Upper latus quadrangular, nearly square, basal margin feebly biconcave.

Carina simply arched, umbo apical, base rounded, roof flat, bordered by slight acute ridges, a faint median ridge, sides narrow, at right angles to roof, concave, bordered by a ridge.

Carinal latus triangular, slightly wider than high, umbo somewhat projecting, rostral margin slightly concave.

Inframedian latus twice as high as its greatest width, which is near apex, slightly constricted above the basal umbo, scutal angle bevelled off.

Rostral latus twice as wide as high, umbo at upper angle of rostral margin. Rostrum extending whole length of rostral latera, narrow, widest above where it is rounded; in younger specimens nearly as wide across the top as long.

Peduncle incomplete.

Labrum subacutely produced.

Mandible with 3 teeth, 1st largest and farther from 2nd than 2nd from 3rd, outer margin of 2nd and 3rd minutely denticulate, inner angle subacute with 5-6 denticles; the 2nd tooth is absent on one of the mandibles of the specimen examined.

Maxilla with a distinct notch separating the outer 4 unequal spines from the inner ones.

Outer maxilla rather broadly ovate, moderately setose.

First cirrus, the 7-jointed posterior ramus longer than the 5-jointed anterior ramus, neither strongly expanded.

Each joint of the other cirri with 3 pairs of moderately long setae and a pair of setules below.

Caudal appendages  $\frac{1}{2}$  length of peduncle of 6th cirrus, slender, 1-jointed, apex blunt with 3-4 setae.

No penis.

No male was found. The larger specimen appears still immature.

Length of capitulum, 4 mm. Breadth, 2 mm.

Colour.—In spirit, white.

Locality.—Cape Point, N.E.  $\frac{1}{4}$  N., distant 18 miles, 135 fathoms, 2 specimens. S.S. "Pieter Faure," 27/2/02. (S.A.M., No. A 3925.)

Closely allied to *S. molliculum*, Pilsbry, 1911, and *laccadivicum* Annand., 1906. Under the latter, Annandale (1913) includes *subflavum* Annand., 1906, and *polymorphum* Hk., 1907. The present species is distinguished by the perfectly calcified valves, median ridge on the carina, greater prominence of the umbo of carinal latus, and by the well-developed rostrum.

*Scalpellum brevicaulis* n. sp.

(Plate I, fig. 11.)

Capitulum ovate, very stout basally, with 14 closely fitting valves covered by an extremely thin cuticle, all the valves rather strongly striate radiately, the margins of the valves being consequently crenulate.

Scutum trapezoidal, occludent margin slightly convex.

Tergum, occludent margin slightly convex, shorter than scutal margin, apex acute.

Upper latus subtriangular, only a slight angle between basal and carinal margins. -

Carina simply arched, umbo apical, sides moderately broad, roof striate, flat, between 2 prominent but rounded ribs, which reach farther down than the centre of the roof, the base being thus V-like incised.

Carinal latus of unusual form, V-shaped, the umbo at apex of V, not projecting very much beyond carina, the "outer arm" of the V forming a normally shaped valve, triangular, rostral margin straight, rather longer than basal margin, the "inner arm" growing into the excavate base of the carina where it meets its fellow, triangular,

striate like the rest of the valve ; in dorsal view the 2 valves look like a W and are of similar form to those of *S. parallelogramma* Hk., 1883.

Inframedian latus large, subquadrangular, sides slightly concave, apex broadly and somewhat obliquely rounded, umbo in middle of base, whence 2 slight ridges radiate to either side.

Rostral latus fully seen only in ventral view, subtriangular, rostral and basal margins confluent, upper inner angle far removed from upper latus.

Rostrum triangular, equilateral, widest at base.

Peduncle characteristic, very short, uppermost circle of plates consisting of 1 below, and of about the same width as, the carina, its carinal margin concave on either side of a median point, and 1 on either side meeting one another below the rostrum, all 3 plates vertically (in long axis of peduncle) striate ; the 2nd row also consisting of 3 plates in similar positions, but the lateral plates reach only half-way round the peduncle ; 3rd row similar, but the lateral plates extending still less round the sides ; below this is a 4th row of 2-3 irregular plates on the carinal side.

Labrum obtusely produced.

Mandible with 3 teeth, 1st largest, outer margin of 2nd and 3rd minutely denticulate, inner angle subacute, denticulate.

Maxilla, inner edge with a scarcely defined notch.

Outer maxilla ovate, setose.

First cirrus, rami subequal, the anterior 7-, the posterior 8-jointed, neither strongly expanded.

Each joint of the other cirri with 4 pairs of long setae, each with a short setule at base, and a pair of setules near base.

Caudal appendages  $\frac{1}{2}$  length of peduncle of 6th cirrus, stout, apex subacute with 3 setae, margins extremely minutely spinulose.

No penis.

*Male*.—One in each scutal pouch. Oval,  $.4 \times .2$  mm., surface very minutely spinulose, antennae near inner end, no trace of valvules or cirri, testis distinct.

The larger specimen contained eggs in an early stage of segmentation. The smaller specimen contained 8 embryos in an early *Cypris*-stage. The antennae and the abdomen with its cirri are well developed, but the bivalve shell is not yet fully chitinised and is rather thick, its 2 component membranes still containing numerous (yolk ?) granules ; the embryos are still surrounded by the chorion and measure  $.4 \times .25$  mm.

*Length* of capitulum, 4 mm. ; of peduncle, .75 mm. *Breadth*, 2 mm.; basal width, side to side, 1.5 mm.

*Colour*.—In spirit, white.

*Locality*.—Algoa Bay, 36 fathoms, 2 specimens on a flabelliform calcareous Polyzoon. S.S. "Pieter Faure," 25/9/01. (S.A.M., No. A 3926.)

This species is closely allied to *S. parallelogramma* Hk., 1883, from the S. Atlantic, 600 fathoms, with which it shares the peculiarity of the V-shaped carinal latus. Hoek remarks that the valve appears as if "formed of 2 valves united together." It differs from this species, however, chiefly in size, in the rostrum, in all the valves being distinctly striate, and in the presence of scales on the peduncle. The arrangement of these latter is very curious.

*Scalpellum eumitos* n. sp.

(Plate I, fig. 12.)

Capitulum, occludent margin nearly straight, carinal margin strongly convex, with 14 closely fitting valves, covered by a pale yellowish cuticle with a short thick pile which becomes longer on the carina, all the valves radiately striate, the lines of growth moderately distinct; the striation, however, is somewhat variable; in the specimens on *Trochocyathus* it is quite strong on all the valves, but in those on *Dendrophyllia* it is very feeble, although traces of it are always to be found on the carina, carinal latera, and inframedian latera; where the striae are not visible, the growth-lines still retain indications of them by being irregularly crenulate or lamellate like the outside of an *Avicula* oyster. In young specimens 2 mm. long the valves are smooth.

Scutum pentagonal, basal and lateral margins subequal, but proportions variable, both sometimes slightly concave, margin abutting against inframedian latus always short.

Tergum, occludent margin straight, equal to or slightly shorter than scutal margin, apex acute.

Upper latus subtriangular, or more correctly pentagonal, the lower margin biconcave.

Carina simply but more or less strongly arched, umbo apical, sides moderately wide below, narrowing upwards, base rounded, roof convex with a narrow median groove between rounded ribs slightly more prominent than the other striae, intraparietes also striate.

Carinal latus triangular, carinal margin more or less strongly

concave, umbo projecting and meeting its fellow over base of carina, rostral margin concave.

Inframedian latus subquadrangular, umbo at basi-rostral angle, slightly narrowing apically.

Rostral latus triangular, wider than high, not meeting upper latus.

Rostrum small but distinct, subtriangular or subquadrate.

Peduncle with 10 rows of 7-8 closely imbricated scales, the intervening cuticle thickly clothed with long hairs.

Labrum acutely produced.

Mandible with 3 teeth, 1st largest, outer margin of 2nd and 3rd minutely denticulate, inner angle subacute, denticulate.

Maxilla, inner edge without a notch.

Outer maxilla somewhat quadrate, setose.

First cirrus, the 10-jointed posterior ramus longer than the 7-jointed anterior one, neither strongly expanded.

Each joint of the other cirri with 3 pairs of long setae and a pair of setules below them.

Caudal appendages  $\frac{3}{4}$  length of peduncle of 6th cirrus, slender, 1-jointed, apically setose.

No penis.

*Male*.—One in each scutal pouch. Ovate, tapering a little posteriorly, 1 mm.  $\times$  .6 mm., surface minutely spinulose, antennae nearly at inner end, apex with 4 small oval valvules (2 slightly larger than the other 2), testis and muscle-fibres very distinct, no trace of cirri.

*Larval Stages*.—Some of the ♀♀ contained eggs in an early stage of segmentation, others contained embryos in an early *Cypris*-stage. The *Cypris*-shell still thick and full of (yolk) granules, antennae and abdomen with its cirri developed, still surrounded by the chorion, .9  $\times$  .6 mm.

*Length* of capitulum, 10 mm.; of peduncle, 4 mm. *Breadth*, 5 mm.

*Colour*.—In spirit, valves white, cuticle yellowish.

*Locality*.—Vasco da Gama Peak, N. 71° E., distant 18 miles (off Cape Peninsula), 230 fathoms, 1 specimen on a *Trochocyathus* coral; Great Fish Point, N.W., distant 9 miles, 57 fathoms, 3 ad. and 6 juv. on a *Dendrophyllia* coral; Cape St. Blaize, N. by E.  $\frac{1}{4}$  E., distant 67 miles, 90-100 fathoms, 4 specimens attached in pairs to the rims of two *Trochocyathus*, their occludent margins inwards; Nanquas Peak, N.  $\frac{3}{4}$  S., distant 21 miles (Algoa Bay), 63 fathoms, 1 on *Trochocyathus*.

S.S. "Pieter Faure," 4/5/00, 3/9/01, 22/12/99, and 23/9/01. (S.A.M., Nos. A 312, A 3909, A 4099, and A 4100.)

A somewhat variable species bearing some resemblance to *S. ornatum*, except in the shape of the carina.

*Aberration*.—A single specimen, No. A 3910 (Cape St. Blaize, N. by E.  $\frac{1}{2}$  E., distant 68 miles, 105 fathoms. S.S. "Pieter Faure," 21/2/02), without data as to attachment, agrees in all respects with the typical form except in two or three points. In the typical form the upper latus is wider than high, the tergal margin being longer than the scutal margin, and the inframedian latus is higher than wide. In this specimen the upper latus is as high as wide, the tergal and scutal margins being equal, the carinal margin thus more oblique and slightly notched, the whole valve more triangular than in the typical form. The inframedian latus is also as high as wide and more triangular in shape. Scutum trapezoidal. All the valves are strongly striate.

A specimen from No. A 4099 is nearly intermediate between the last specimen and the typical form.

Further evidence that this specimen is only an aberrant form of *eumitos*, which has retained some of the youthful characters, is derived from a study of a long series of juvenile specimens. Most of these were taken from lot A 3909, but some of the other lots also provided specimens. It will be simplest to describe them according to size, beginning with the smallest and youngest stage. These stages must not, of course, be taken as corresponding with the stages between successive ecdyses.

A *Cypris*-larva, recently attached, measures 1 mm.  $\times$  6 mm., and is nearly ready to cast off the *Cypris*-shell. The primordial scuta, terga, and carina are developed, and also the carinal latera and upper latera. Each of these latter plates is represented only by a minute circular point. Below them is another similar minute calcified point, which probably represents the inframedian latus as it is situated in the position later occupied by this valve. There are no traces of the rostral latera. It will be remembered, in connection with this last point, that in *Smilium pollicipedoides* the inframedian latus was the last valve to be formed.

The primordial valves have the same perforated structure as represented in Hoek's figure of the young of *S. stearnsi* (Siboga Exp. Monogr., 31A, pl. vi, figs. 11 and 12). Hoek does not describe the structure, but it seems to be exactly similar to that of the 2 larger valvules of the  $\sigma$  of *S. botellinae* n. sp., described below (p. 45).

The figures of the young Cirripede given by Darwin, Gruvel, and in MacBride's Text-book of Embryology, vol. i (to quote only those accessible to me), show the primordial valves as *reticulated*, but except in Darwin's Monograph no description is appended. Hoek's magnified fig. 12 is a very good representation of the structure, but the shading *within* the circles should have been omitted, as it gives them the appearance of shiny raised warts or granules instead of perforations. Krüger (1911, Beitr. Cirrip. Ostas., p. 20) speaks of these valves in *S. stearnsi* as "sieve-like."

Whether these primordial valves *at this stage* consist merely of chitin, as in Darwin's description, or are calcified, I am unable to say, as there is not enough material. They appear to be calcified, but later they certainly are impregnated with lime, though they still retain their porous nature and are clearly visible in a specimen of 7 mm. capitular length.

It will be seen that the above description differs from that given by Darwin for *Lepas australis* (Monogr. Cirrip. *Lepadidae*, p. 22; *Balanidae*, p. 129, pl. xxx, figs. 3, 3A).

The second stage measures 1.5 (total length)  $\times$  .6 mm.—Here the primordial valves have been considerably extended by non-porous additions. The upper latus is rectangular in shape, with the carinal-basal angle rounded off. The inframedian latus is oval. Carinal latus well-developed, but the rostral latus is only just beginning to be developed. Rostrum apparently absent, but as there is only 1 specimen in this stage, its presence or absence must be left undecided. Lateral and basal margins of the scutum confluent. A ring of 4 plates on the peduncle, close up under the capitulum; the one below the carinal latus projects outwards (dorsally) and downwards towards the point of attachment, and is longer than the lateral one below the inframedian latus (*cf.* Hoek's figure of the young of *S. stearnsi* in *loc. cit.*, pl. vi, fig. 11).

Third stage, from 1.5-2 mm. (total length).—Lateral and basal margins of scutum forming an angle slightly over 90°. Inframedian latus more quadrate, but wider below than apically, thus sometimes subtriangular. Rostral latus developed but scarcely bigger than the rostrum.

Fourth stage, from 2-3 mm.—Angle between the lateral and basal margins of the scutum bevelled off. Upper latus still with the tergal and scutal margins subequal; its basal-carinal angle bevelled off, straight or even slightly concave. Inframedian latus growing more rapidly above than below, the umbo consequently tending to approach

the base. Several rings of peduncular plates intercalated between the original 4 and the base of the capitulum.

Fifth stage, 3 mm. upwards.—The margin of the scutum abutting against the inframedian latus becomes more marked and the upper latus wider in proportion to its height.

*Scalpellum uncinatum* n. sp.

(Plate I, fig. 13.)

Capitulum of 14 more or less closely fitting valves covered by a thickish, yellow, glabrous cuticle, growth-lines quite distinct, occludent margin straight, carinal margin convex.

Scutum pentagonal, umbo slightly recurved, lateral and basal margins more or less concave, 2 very slight ridges diverging from umbo.

Tergum triangular, occludent margin shorter than basal margin, apex acute. Upper latus wider than high, quadrangular; basal margin slightly concave or biconcave, 1 or 2 ridges (if 2, close together) running from umbo to basi-carinal angle.

Carina simply but strongly arched, umbo apical or subapical, sides narrow, base rounded, roof flat between 2 prominent but rounded ribs.

Carinal latus triangular, rostral margin straight or slightly concave, carinal margin more or less concave, umbo more or less projecting, sometimes straight, sometimes distinctly hook-like.

Inframedian latus quadrangular, at least twice as high as wide, umbo at basi-rostral angle, sometimes rather prominent, with a more or less pronounced ridge from umbo to upper carinal angle, upper scutal angle sometimes bevelled off.

Rostral latus about as high as wide, but variable, scutal margin more or less convex, rostral margin very short, umbo acute.

Rostrum small, subtriangular or subquadrate.

Peduncle with 12 rows of about 10 rather closely imbricated scales.

Labrum subacutely produced.

Mandible with 3 teeth, 1st largest, 2nd and 3rd subequal, inner angle subacute, denticulate.

Maxilla, inner edge with a very slight and narrow notch.

Outer maxilla somewhat quadrate.

First cirrus, the posterior 8-jointed ramus longer than the 6-jointed anterior ramus, neither strongly expanded.

Each joint of the other cirri with 4 pairs of long setae, each with a setule at base, and a pair of short setae below.

Caudal appendages  $\frac{1}{2}$  length of peduncle of 6th cirrus, short and stout, apex with 2 setae.

No penis.

*Male*.—One in each scutal pouch. Broadly oval,  $.9 \times .6$  mm., surface minutely spinulose, antennae at inner end, apex with 4 rather large oval valvules, 2 a little larger than the other 2, no trace of cirri.

*Cypris-larva*.—About 15 specimens from one ♀, of typical structure, yellowish, 1 mm.  $\times$  .6 mm.

*Length* of capitulum, 6 mm. ; of peduncle, 4.5 mm. *Breadth*, 4 mm.

*Colour*.—In spirit, valves white, cuticle yellowish.

*Locality*.—Nanquas Peak, N.  $\frac{3}{4}$  W., distant 21 miles (E. of Algoa Bay), 63 fathoms, 10 specimens on a Hydroid ;  $32^{\circ} 45' S.$ ,  $28^{\circ} 26' E.$  (off Cape Morgan), 36 fathoms, 2 specimens ; Glendower Beacon, N.  $\frac{1}{2}$  W., distant 16 miles (off Port Alfred), 66 fathoms, 3 ad. and 5 juv. on a Hydroid ; Cape St. Francis, N.E. by E., distant 32 miles, 74 fathoms, 10 juv. on a Hydroid ; Umkomaas River, N.W. by W.  $\frac{1}{2}$  W., distant 5 miles (Natal), 40 fathoms, 1 juv. ; Scottburgh, N.W. by N., distant 8 miles (Natal), 92 fathoms, 1 juv. S.S. "Pieter Faure," 23/9/01, 12/1/99, 10/9/01, 19/2/02, 31/12/00, and 7/3/01. (S.A.M., Nos. A 325, A 3907, A 4101, A 4102, A 4297, and A 4298.)

A variable species allied to *calcaratum* and *salartiae*.

*Scalpellum natalense* n. sp.

(Plate I, fig. 14.)

Capitulum with 14 closely fitting, smooth valves covered by a very thin cuticle, both margins convex.

Scutum trapezoidal, ocludent margin convex, umbo acute, recurved, lateral margin straight.

Tergum triangular, ocludent margin convex, apex acute.

Upper latus quadrangular, nearly square, carinal margin longer than scutal, basal margin excavate for apex of inframedian latus.

Carina simply arched, umbo apical, roof slightly concave between indistinct rounded borders, sides very narrow.

Carinal latus subquadrate, much higher than wide, umbo at base meeting its fellow below the carina, rostral margin straight.

Inframedian latus at least twice as high as wide, oblong, margins parallel, umbo at basi-rostral angle.

Rostral latus triangular, about as high as wide, no basal margin, umbo at upper end of rostral margin.

Rostrum as high as rostral latus, linear, slightly wider below, apex rounded.

Peduncle short, with 6 rows of 5 moderately closely imbricated scales. Labrum obtusely produced.

Mandible with 3 equidistant teeth, 1st slightly larger than 2nd and 3rd, outer margin of 3rd very minutely denticulate, inner angle subacute, minutely denticulated.

Maxilla, inner edge without a notch, but a gap between the 4 unequal outer spines and the inner ones.

Outer maxilla ovate, setose.

First cirrus, the 6-jointed posterior ramus slightly longer than the 5-jointed anterior ramus, neither strongly expanded, but rather densely setose.

Each joint of the other cirri with 3 pairs of long setae, 1 pair of shorter setae below these, and below these again 1 pair of setules.

Caudal appendages slender,  $\frac{1}{2}$  length of peduncle of 6th cirrus, 1-jointed, apex subacute with 2 setae.

No penis.

*Male*.—One in a pouch under each scutum. Oval, .4 mm.  $\times$  .2 mm., surface very minutely spinulose, antennae near the inner end, apex with 4 subequal, minute roundish-oval valvules; testis distinct, no trace of cirri.

*Cypris-larva*.—12 specimens in the adult ♀, of typical form and structure, .6 mm.  $\times$  .3 mm., yellowish.

*Length* of capitulum, 3.5 mm.; of peduncle, 1 mm. *Breadth*, 1.75 mm.

*Colour*.—In spirit, white.

*Locality*.—Tugela River, N. by W.  $\frac{3}{4}$  W., distant 21 miles (Natal), 79 fathoms, 1 ad. and 1 juv. on a Hydroid. S.S. "Pieter Faure," 9/1/01. (S.A.M., No. A 4104.)

Close to *S. valvulifer* in the shape of the upper and inframedian latera, but distinguished by the shape of the carina, rostral latus, and rostrum.

*Scalpellum sinuatum* Pilsbry.

1907. *Scalpellum sinuatum*. Pilsbry, Bull. U.S. Nat. Mus., No. 60, p. 50, fig. 16.

The identification of these specimens has caused me considerable difficulty, and other workers may differ from my conclusions.

An account of the peculiar features will be given first, so that the relationships may be better appreciated.

There are 6 specimens: 5 from one haul, designated here as (*a*), and 1 from another haul, approximately in the same locality, (*b*).

The inframedian latus in (*b*) and 2 specimens of (*a*) is hour-glass shaped, about equally wide above and below, the upper margin concave, touching the upper latus, one corner touching also the scutum, umbo in the middle of the constriction. In 2 others of (*a*) it narrows from the base upwards, ending in a blunt apex in contact with the upper latus; the 6th specimen (*b*) is similar to the last 2, but does not reach the upper latus. A microscopic examination shows, however, that in reality these subtriangular forms are hour-glass shaped with a median umbo, calcification having proceeded much more rapidly in the concave sides than at either end, thus obliterating the true shape when superficially examined. Thus this valve is variable in the ultimate shape it assumes, and the objection that we are here dealing with 2 separate species is shown to be invalid on this one ground alone, apart from other considerations.

The second point concerns the rostrum, which is also very variable. In 2 specimens (*a*), of capitulum length 6 and 5 mm., it is a small triangular rudiment at the top of the rostral latera; in one (*a*), length 7 mm., it is narrow, tapering basally, and separating the rostral latera only in their upper half; in (*b*) it is similar to the last, but separates the rostral latera in their upper three-quarters; lastly, in the other 2 (*a*), lengths 6.5 mm. and 4 mm., it is of nearly equal width throughout, but slightly larger at the upper end, and separates the rostral latera for their entire length. It will be seen that degree of development of the rostrum cannot be correlated with the size and, therefore, the age of the specimen. Nor is there any correlation between the variability of the rostrum and the inframedian latus. Thus, of the 3 specimens with an hour-glass shaped inframedian latus, one has a rudiment of a rostrum, another has the rostral latera separated for half their length, and the third has them completely separated.

In all other respects, with the exception of a reduction in the number of peduncular scales in the largest specimen, all the specimens are in perfect agreement with one another.

The series is interesting in showing the simultaneous variation in 2 valves, and also how easily there can be evolved a species permanently lacking a rostrum and with a strong tendency to eliminate the inframedian latera, thus becoming only 11-valved. There are already a large number of species in which the rostrum is entirely absent or rudimentary; and it is in the practical difficulty of separating these

two series that Gruvel's 1905 classification appears so artificial. A definite stage in the evolution of *Scalpellum* would seem to be indicated by the loss of the rostrum. The next stage is the elimination of the inframedian latera which is nearing fulfilment in several species of the group *Arcoscalpellum*, as remarked upon by Pilsbry (1908, Proc. Ac. Nat. Sci. Philad., vol. lx, p. 109).

At first sight these specimens bear an extraordinary likeness to *S. albatrossianum* Pilsbry (1907, *loc. cit.*, p. 54, fig. 19, and see Annandale, Illustr. Zool. Investigator, "Crust. Entomostr.," pl. iii, fig. 10), the only difference in the paired valves being the upper end of the inframedian latus (in the hour-glass form): here it is concave, whereas in *albatrossianum* it is convex. This is so slight a difference, especially in view of the above-mentioned variability, that it would not suffice to separate the two but for the presence of the rostrum in the Cape specimens.

This feature brings the specimen close to *sinuatum*, particularly to the young form figured by Pilsbry. This species has the upper end of the hour-glass-shaped inframedian latus concave, but, contrary to what is the case in the Cape specimens, the upper end is wider than the lower, especially in Pilsbry's larger specimen. As regards the rostrum, 2 of the Cape specimens present exactly the same appearance as shown in Pilsbry's figure.

In size, the largest of the present specimens corresponds exactly with Pilsbry's smaller specimen.

The only question is whether the sinus in the upper latus of the larger type-specimen is normal or not. And this must wait for an answer until more N. Atlantic specimens are obtained.

A comparison with *tenue* Hoek, 1883, shows that the Cape specimen, which most nearly resembles this species in the inframedian latus, has a fully developed rostrum, whereas *tenue* has only a mere rudiment.

On the whole, therefore, I think there is good reason for assigning these specimens to *sinuatum*.

The difficulties of identification are shown by the fact that in the explanation to pl. iii, fig. 10, of Illustr. Zool. Investigator, *S. tenue* Annandale (non Hoek) (Herdman's Ceylon Pearl Fish. Suppl. Rep., 31, p. 142) is made a synonym of *albatrossianum*, whereas in a later publication (1913, Rec. Ind. Mus., vol. ix, pt. 4, p. 230) it is made synonymous with *S. pacificum* Pilsbry, 1907.

Annandale thinks that this latter species is most closely related to *albatrossianum* and also with *novae-zealandiae* Hoek, 1883. Pilsbry,

in describing *albatrossianum*, also refers to the likeness with Hoek's species.

Thus there is a very closely allied group of species, which later may be regarded only as varieties or local forms of one. They are *tenue* Hk.; *albatrossianum* Pilsbry, 1907; *pacificum* Pilsbry, 1907; *wood-masoni* Annandale, 1906; *sinuatum* Pilsbry, 1907; *novae-zealandiae* Hk., 1883, and perhaps also a few other species such as *minutum* Hk., 1883, and *australicum* Hk., 1883.

Details of the appendages are as follows :—

Labrum bluntly produced.

Mandible with 3 teeth, a minute secondary tooth between 1st and 2nd varying in size on the two mandibles, inner angle acute, denticulate.

Maxilla, inner edge with a gap, but no notch, between the 4 unequal outer spines and the inner ones.

Outer maxilla ovate, setose "olfactory tubules" very long, reaching to apex of maxilla.

First cirrus, anterior ramus 6-jointed, posterior 8-jointed, subequal, joints expanded, almost moniliform, especially on the anterior ramus, setae on this latter ramus stout.

Each joint of the other cirri with 4 groups of 1 long seta and 1 short setule.

Caudal appendages equal to peduncle of 6th cirrus, 4-jointed, each joint with an apical seta.

No penis.

*Male*.—One in each scutal pouch. In one case 2 were found on the one side, both apparently in the same stage of development. Oval, .9 mm.  $\times$  .5 mm., surface very minutely spinulose. Antennae in the middle of one side, so that when detached the little animal resembles a mushroom in shape. No trace of any valvules or cirri. Testis and the criss-cross series of muscle-fibres very distinct.

Two of the specimens (6 mm.) contained a small number of ova in an undifferentiated stage of development.

*Length* of capitulum, 7 mm.; of peduncle, 2.5 mm. *Breadth*, 3 mm.

*Colour*.—In spirit, white.

*Locality*.—Cape Point, N.E. by E.  $\frac{1}{4}$  E., distant 40 miles, 800–900 fathoms, 1 specimen; Cape Point, N. 86° E., distant 43 miles, 900–1000 fathoms, 5 specimens. S.S. "Pieter Faure," 14/7/03 and 19/8/03. (S.A.M., Nos. A 330 and A 331.)

*Geogr. Distribution*.—East Coast of N. America, 1731 fathoms (Pilsbry).

*Scalpellum botellinae* n. sp.

(Plate I, fig. 15.)

Capitulum ovate, both margins convex, with 14 closely fitting valves covered by a very fine cuticle, all the paired valves (except the inframedian latus) faintly striate radiately, the striae some little distance apart.

Scutum trapezoidal, lateral margin slightly convex, apical umbo acute, somewhat recurved, basal margin convex, a slight ridge more distinct than the other striae from apex to basi-lateral angle.

Tergum triangular, ocludent margin straight, much shorter than scutal, carinal margin excavate just below the acute apical umbo, ridge from umbo to basi-carinal angle very indistinct.

Upper latus trapezoidal, basal margin very short.

Carina simply arched, extending nearly to apex of tergum, umbo apical, roof flat between well-marked but rounded bordering ridges, base rounded quadrate, sides very narrow, without oblique grooves.

Carinal latus quadrangular, rostral margin angularly convex, umbo bluntly and shortly projecting beyond carina, not meeting its fellow, there being an inner extension of the valve which joins that of the other side below the base of the carina, very much as in *parallelogramma* and *brevicaulis*.

Inframedian latus subtriangular, scarcely higher than its basal width, umbo at the subacute apex, which meets the upper latus, sides concave. In the young the valve is more quadrangular, not having yet begun to expand at the base.

Rostral latus trapezoidal, twice as wide as high, basal margin slightly longer than rostral margin.

Rostrum distinct, rather stout, linear or dumb-bell shaped; in the young it is triangular, widest above and only separating the rostral latera in their upper half.

Peduncle short, with 8 rows of 4 closely imbricated scales.

Labrum obtusely produced.

Mandible with 4 teeth besides the inner angle, the 1st largest, inner angle acute, minutely denticulate. In 1 specimen both mandibles have a 5th well-developed tooth between the 1st and 2nd.

Maxilla, a very narrow gap separating the 4 outer unequal spines from the inner ones.

Outer maxilla broadly ovate, setose.

First cirrus, the 8-jointed posterior ramus slightly longer than the 7-jointed anterior ramus, neither strongly expanded but both rather densely setose.

Each joint of the other cirri with 3 pairs of long setae, 1 pair of shorter setae, and below these 1 pair of setules.

Caudal appendages entirely absent.

No penis.

*Male*.—One in each scutal pouch, very large in proportion to the size of the scutum, its inner end reaching almost to lateral margin of the valve. Oval, 1 mm.  $\times$  .6 mm., surface minutely spinulose, antennae near the inner end, apex turned inwards towards the other ♂, with 4 valvules, 2 of which are large, .2 mm. in diameter, roundish oval, the other 2 minute, no trace of cirri. The 2 larger valvules are perforated by a number of holes, appearing exactly like a tracheal "sieve-plate" in a plant, and resembling the structure of the primary valves described under *S. eumitos*, and figured for *S. stroemii* by Hoek (Siboga Exp. Monogr., 31A, pl. vi, figs. 11 and 12).

*Cypris-larva*.—Nine specimens in one ♀, of typical structure, 1 mm.  $\times$  .5 mm., yellowish.

Another ♀ specimen possesses in one scutal pouch a fully developed ♂ and in the other a *Cypris-larva*. The latter has crept in head foremost, as would be expected, and has not yet thrown off the *Cypris*-shell.

*Length* of capitulum, 4 mm.; of peduncle, .75 mm. *Breadth*, 2.5 mm.

*Colour*.—In spirit, white.

*Locality*.—Cape Natal, W. by N., distant 4 miles, 47 fathoms; same bearings, distant 6 miles, 54 fathoms. Several specimens on the arenaceous Rhizopod *Botellina pinnata* Pearcey. S.S. "Pieter Faure," 14/12/00. (S.A.M., Nos. A 4108, A 4109.)

This Rhizopod was found growing in enormous numbers in certain localities, forming the chief component of the bottom samples. Besides the *Scalpellum*, a sessile barnacle, solitary corals, an Alcyonarian, a compound Tunicate, Hydroids, Serpulae, and other worm-tubes were found using the *Botellina* as a support.

*S. botellinae* is closely allied to *S. vitreum* Hk., 1883, but differs chiefly in size and in having a larger inframedian latus, a lower rostral latus, a well-developed rostrum, and in lacking the lateral grooves on the carina.

*Scalpellum micrum* Pilsbry.

1907. *Scalpellum micrum*. Pilsbry, Bull. U.S. Nat. Mus., No. 60, p. 57, fig. 21.

One specimen nearly twice the size of the type affixed to a Hydroid, with a smaller specimen (capitulum, 4.5 mm.) attached to its peduncle. Both specimens agree with Pilsbry's description, except that the subcarinal margin of the carinal latus is slightly convex instead of concave. The peduncle of the larger specimen differs from that of the type in that it is longer relatively to the length of the capitulum, and has rather wide bare spaces between the scales. When compressed, however, it appears exactly as in Pilsbry's figure, and like the type has 5 rows of 4 scales. Each scale has a few short hairs on its lower surface. This difference in the relative length of the peduncle is most probably due to the method of preservation.

Labrum strongly and subacutely produced.

Mandible with only 2 teeth besides inner angle, 1st farther from 2nd than 2nd from inner angle, the latter trifold in the one mandible, bifid in the other.

Maxilla, inner edge with a rather deep notch separating the outer 3-4 spines from the 7-8 inner ones, 1-2 fine setules in the notch.

Outer maxilla ovate, labial palp moderately slender, both setose.

First cirrus, the 6-jointed anterior ramus shorter and stouter than the 9-jointed posterior ramus.

Caudal appendages very minute, scarcely  $\frac{1}{2}$  width of base of peduncle of 6th cirrus, 1-jointed, tipped with setae.

Penis absent.

*Male*.—One in a pouch under each scutum in the larger specimen, the smaller was not examined. Oval, .75 mm.  $\times$  .5 mm., surface with extremely minute spinules. No internal structure, except a not very distinct testis. No trace of any valvules at the apex.

The larger (♀) specimen contained a small number of eggs. These are .5 mm.  $\times$  .3 mm., and are in an early *Metanauplius* stage. At one end are 5 pairs of little buds, presumably incipient cirri, although it is very unusual for the posterior appendages to appear before the anterior ones. No trace of appendages at the other end can be perceived.

*Length* of capitulum, 9 mm.; of peduncle, 4.5 mm. *Breadth*, 4.5 mm.

*Colour*.—In spirit, white.

*Locality*.—East London, N.W.  $\frac{1}{2}$  N., distant 20 miles, 400–450 fathoms, 2 specimens. S.S. “Pieter Faure,” 17/4/01. (S.A.M., No. A 3911.)

*Geogr. Distribution*.—Between Bahamas and Cape Fear, N. Atlantic, 294 fathoms (Pilsbry).

*Scalpellum imperfectum* Pilsbry.

1907. *Scalpellum imperfectum*. Pilsbry, Bull. U.S. Nat. Mus., No. 60, p. 75, fig. 30.

The single specimen agrees with Pilsbry's description and figure, except that the projection near the apex of the scutum is more acute—but not nearly so long and narrow as in *S. sanctaebarbarae* Pilsbry (*loc. cit.*, p. 77, fig. 31)—and the basal margin of the upper latus is slightly emarginate.

As remarked by Annandale (1913, Rec. Ind. Mus., vol. ix, pt. 4, p. 233), this species and *sanctaebarbarae* are very close to *gruveli* Annand., 1906, and may possibly be only varieties of the last-mentioned species. This author makes *S. chitinosum* Hoek, 1907, a synonym of *gruveli*. The differences between *gruveli*, *sanctaebarbarae*, and *chitinosum* are certainly very slight, but, on the other hand, *imperfectum* seems to stand somewhat apart as regards the shape of the scutal tooth.

Mouth-parts and appendages as described by Pilsbry.

*Male*.—Two in each scutal pouch. Oval, 1.3 mm.  $\times$  .75 mm., the surface rather thickly covered with small hairs. As in *gruveli*, the antennae are situate in the middle of one side. In other respects also there is scarcely any difference between these ♂♂ and those of the Indian Ocean species, as described by Stewart (1911, Mem. Ind. Mus., vol. iii, pt. 2).

*Length* of capitulum, 25 mm.; of peduncle, 11 mm. *Breadth*, 14 mm.

*Colour*.—In spirit, valves white, membrane pinkish.

*Locality*.—Cape Point, N.E. by E.  $\frac{1}{4}$  E., distant 38 miles, 755 fathoms, 1 specimen. S.S. “Pieter Faure,” 24/6/03. (S.A.M., No. A 282.)

*Geogr. Distribution*.—East coast of N. America, 781–1230 fathoms (Pilsbry).

## Gen. LITHOTRYA Sow.

1822. *Lithotrya*. Sowerby, Gen. Shells.  
 1824. *Litholepas*. de Blainville, Dict. Sci. Nat.  
 1825. *Absia*. Leach, Zool. Journ., vol. ii.  
 1825. *Brismaeus* and *Conchotrya*. Gray, Ann. Philos., N.S., vol. x.  
 1851. *Lithotrya*. Darwin, Monogr. Cirrip., p. 332.  
 1900. „ Borradaile, Proc. Zool. Soc. Lond., 1900, p. 798.  
 1902. „ Gruvel, Arch. Mus. Paris (4) IV, fasc. 2.  
 1903. „ Borradaile in Gardiner's F. Mald. and Laccad. Archip., vol. i, pt. 4.  
 1905. „ Gruvel, Monogr. Cirrip., p. 96.  
 1907. „ Hoek, Siboga Exp. Monogr., 31A, p. 122.  
 1907. „ Pilsbry, Bull. U.S. Nat. Mus., No. 60, p. 6.  
 1909. „ Gruvel, Tr. Linn. Soc. Lond., vol. xiii, pt. 1, pp. 23, 26.  
 1912. „ Gruvel, Bull. Mus. Paris, No. 6, p. 347.

*Lithotrya valentiana* (Gray).

1825. *Conchotrya valentiana*. Gray, *loc. cit.*  
 1857. *Lithotrya* „ Darwin, *loc. cit.*, p. 371, pl. viii, fig. 5.  
 1905. „ „ Gruvel, *loc. cit.*, p. 101, fig. 113.  
 1914. „ (*Conchotrya*) *valentiana*. Annandale, Rec. Ind. Mus., vol. x, pt. 5, p. 275.

Length of peduncle not much more than the length of the capitulum measured along rostral margin of scuta; upper row of scales quadrangular, contiguous, not serrate, lower edges overlapped by the next row, second and succeeding rows contiguous, overlapping the bases of the row above, scales subcircular, not serrate.

No basal cup; 1 specimen, 7 mm. long, shows the attachment to a lateral disc, but the burrows were unfortunately not preserved.

Valves divergent and truncate apically, apical and basal width equal; thin, semi-transparent, the ridges moniliform in appearance. Scuta fitting into a deep groove in the terga. Terga with a groove, shallow in the larger, but more marked and rectangular in the smaller specimens; internal growing surface of scuta and terga as figured by Darwin for *L. truncata*. The smaller specimens bear a distinct likeness to *valentiana*, and may serve to connect the two species as suggested

by Darwin. Carina with strong ridge internally, the angles in the younger specimens sharper, *i.e.* more rectangular, than in the older ones (again connecting *truncata* and *valentiana*); inner growing surface oblique to the long axis. Latera absent. Rostrum very narrow and short.

Caudal appendages  $\frac{1}{2}$  length of 6th cirrus. Mandible with 6-7 denticles between 1st and 2nd teeth, and 4 between 2nd and 3rd teeth.

*Length*.—Up to 10 mm.

*Colour*.—Brownish, peduncle lighter, valves purplish within.

*Locality*.—Mozambique, November 1912 (K.H.B.), 4 specimens in coral rock at high-water mark. (S.A.M., No. A 2218.)

*Geogr. Distribution*.—Red Sea (Darwin), Zanzibar (Gruvel), Baluchistan (Annandale).

#### Fam. LEPADIDAE.

1857. *Lepadidae* (part). Darwin, Monogr. Cirrip., p. 8.

1905. *Pentaspidae*. Gruvel, Monogr. Cirrhip., p. 102.

1907. *Lepadinae* (subfam.). Pilsbry, Bull. U.S. Nat. Mus., No. 60, pp. 3, 4.

1909. *Lepadidae* (*Lepadinae*). Annandale, Mem. Ind. Mus., vol. ii, pt. 2, p. 63.

1911. „ Krüger, Beitr. Naturg. Ostas, p. 22.

#### Key to the South African genera.

1. Valves fully calcified, approximate.
  - a. Carina extending up between terga. One or more filamentary appendages at base of 1st cirrus. Caudal appendages smooth . *Lepas*.
  - b. Carina extending only to base of terga. No filamentary appendages. Caudal appendages spinose.
    - i. Carina with the sides narrow throughout . . . *Poecilasma*.
    - ii. Carina with the sides widening towards base . . . *Megalasma*.
2. Valves incompletely calcified, widely separated.
  - a. Valves 5 or sometimes apparently 7 (the scutum being divided into two parts). Carina ending below in a disc, cup, or fork. No filamentary appendages. Caudal appendages present . . . *Octolasmis*.
  - b. Valves 2-5, very small. Carina, when present, with upper and lower ends alike. With filamentary appendages. No caudal appendages

*Conchoderma*.

## Gen. LEPAS Linn.

1758. *Lepas* (part). Linnaeus, Syst. Nat., ed. 10, p. 667.  
 1851. „ Darwin, Monogr. Cirrip., p. 67.  
 1905. „ Gruvel, Monogr. Cirrhip., p. 104.  
 1906. „ Annandale, Spolia Zeylanica, vol. iii, p. 193.  
 1907. „ Pilsbry, Bull. U.S. Nat. Mus., No. 60, p. 79.  
 1909. „ Annandale, Mem. Ind. Mus., vol. ii, pt. 2, p. 72.  
 1910. „ Stebbing, Gen. Cat. S.A. Crust., p. 563.

In the Museum collection there are specimens of two species not recorded in Stebbing's 1910 catalogue, both cosmopolitan :—

*Lepas anserifera* L., from Table Bay and Algoa Bay.

*Lepas pectinata* Darw., from Durban, on *Spirula* and *Janthina* shells.

## Key to the South African species.

1. Carina terminating below in a fork, more or less distinctly developed. Valves not particularly thin.
  - a. Valves more or less strongly striate radiately, especially the terga.
    - i. Occludent margin of scutum arched, protuberant. Five filamentary appendages . . . . . *anserifera* L.
    - ii. Occludent margin close to the ridge from umbo to apex. One filamentary appendage . . . . . *pectinata* Darw.
  - b. Valves smooth or only faintly striate.
    - i. Carina not markedly separated from scuta.
      - α. An internal umbonal tooth on right scutum only . . . . . *anatifera* L.
      - β. Both scuta with a tooth . . . . . *australis* Darw.
    - ii. Carina more or less prominently separated from scuta.
      - α. Three filamentary appendages. Occludent margin convex. Terga not projecting ventrally . . . . . *hilli* (Leach).
      - β. Two filamentary appendages. Occludent margin straight. Terga projecting ventrally . . . . . *testudinata* Auriv.
2. Carina terminating below in a flat oblong external disc, umbo angularly projecting. Valves thin and papery . . . . . *fascicularis*, E. and S.

## Gen. POECILASMA Darwin.

1844. *Trilasmis*. Hind's, Voy. Sulphur. Mollusca.  
 1848. *Anatifa*. Gray, Proc. Zool. Soc. Lond., 1848, p. 44.  
 1851. *Poecilasma*. Darwin, Monogr. Cirrip., p. 99.  
 1884. *Temnaspis*. Fischer, Bull. Soc. Zool. Fr., vol. ix, p. 357.  
 1888. *Poecilasma*. Hoek, Challeng. Rep., vol. viii, p. 43.  
 1894. „ Aurivillius, K. Sv. Vet. Ak. Handl., vol. xxvi, pt. 7, p. 9.  
 1905. „ Gruvel, Monogr. Cirrhip., p. 113.

1907. *Poecilasma*. Hoek, Siboga Exp. Monogr., 31A, p. 3.  
 1907. „ Pilsbry, Bull. U.S. Nat. Mus., No. 60, p. 82.  
 1909. „ Annandale, Mem. Ind. Mus., vol. ii, pt. 2, p. 86.  
 1911. „ Krüger, Beitr. Naturg. Ostas, p. 35.

*Key to the South African species.*

1. Capitulum compressed, narrow. Carina basally truncate . *kaempferi* Darw.  
 2. Capitulum more or less bullate, broad. Carina ending below in a small embedded disc . . . . . *crassa* (Gray).

*Poecilasma kaempferi* Darwin.

1857. *Poecilasma kaempferi*. Darwin, *loc. cit.*, p. 102, pl. ii, fig. 1.  
 1851. „ *aurantia*. Darwin, *ibid.*, p. 105, pl. ii, fig. 2.  
 1902. „ *kaempferi*. Gruvel, Zool. Travaill. Talisman. Cirrhip., p. 46, pl. iv, fig. 1.  
 1907. „ *dubium*. Hoek, *loc. cit.*, p. 6, pl. i, figs. 2-4 ; pl. x, figs. 1, *a-d*.  
 1907. „ *kaempferi*. Pilsbry, *loc. cit.*, p. 84, pl. v, figs. 10, 11 ; pl. vi, figs. 3-5.  
 1907. „ „ subsp. *litum*. Pilsbry, *ibid.*, p. 85, pl. vi, figs. 1-2.  
 1907. „ „ subsp. *novaeangliae*. Pilsbry, *ibid.*, p. 85, pl. vi, figs. 13-14.  
 1907. „ *inaequilaterale*. Pilsbry, *ibid.*, p. 85, pl. vi, figs. 6-8, 11, 12.  
 1909. „ *kaempferi*. Annandale, *loc. cit.*, p. 90, pl. vii, fig. 8, and Illustr. Zool. Investig., "Cr. Entomostr.," pl. iii, fig. 1 (1908).  
 1911. „ „ Krüger, *loc. cit.*, p. 36.  
 1911. „ „ var. *litum*. Krüger, *ibid.*, p. 36, pl. iii, figs. 24, 25 ; text-figs. 68-71.  
 1911. „ „ var. *dubium*. Krüger, *ibid.*, p. 37, pl. iii, fig. 26 ; text-figs. 72-76.  
 1922. „ „ var. *aurantium*. Weltner, Wiss. Erg. D. Tiefsee Exp., vol. xxiii, pt. 2, p. 79.

A large number of specimens with the capitulum ranging from 1.5 mm.-14 mm., all taken from a single specimen of *Geryon quinquedens*.

The majority resemble the form *litum* Pilsbry, with a strongly arcuate ocelludent margin. But a few are indistinguishable from

Pilsbry's figures of *inaequilaterale*. There are many stages from the perfectly equivalve to the strongly inequivalve form. The width (from side to side) also varies, but is never as great as in *P. crassa*. Consequently I consider *inaequilaterale* as only a variety or subspecies of *kaempferi*.

The surface sculpturing has the appearance of very fine wrinkling, the radial striae are never stronger than, though sometimes as strong as, the growth-lines.

One specimen is remarkable in that the umbones of the terga are much less prominent, approximating to those of *crassa*; and, moreover, in that the terga and scuta are completely fused, though the dividing suture can still be traced, and the apices of the scuta project beyond the occludent margin as small acute points.

Another specimen has very much reduced terga, and, consequently, the ratio of length to breadth is much greater. Both aberrant specimens are sculptured in the manner described above.

Cirri as described by Darwin.

Caudal appendages  $\frac{1}{3}$  to nearly  $\frac{1}{2}$  length of peduncle of 6th cirrus, apically setose.

Penis with a short stalk, then widening abruptly (but not so wide and stout as in *crassa*), tapering to a fine point, on which is situate a dense tuft of setae; the whole transversely rugulose and setose.

*Locality*.—Cape Point, E. by N., distant 29 miles, 250–300 fathoms, many specimens, together with *P. crassa* on *Geryon quinquedens*; Buffalo River, N., distant 15 miles, 310 fathoms, 4 specimens on *Jasus parkeri* Stebb. S.S. "Pieter Faure," 27/8/03 and 24/4/01. (S.A.M., Nos. A 3902 and A 3913.)

*Geogr. Distribution*.—Japan, on *Inachus kaempferi* (Darwin: *kaempferi*); Madeira, on *Homola cuvierii* (Darwin: *aurantia*); Cape Bojador, 410–782 metres, on *Echinoids* (Gruvel); Florida, 170 fathoms (Pilsbry: *litum*); East coast of N. America, 194 fathoms, on *Eupagurus politus* and *Lithodes agassizii* (Pilsbry: *novaeangliae*); East coast of N. America and Florida, 70–80 fathoms, on *Scyramathia crassa* (Pilsbry: *inaequilaterale*); 5° S. 132° E., 204–304 metres (Hoek); Gulf of Manaar, 775 metres (Annandale); Japan, on *Macrocheira kaempferi* and *Geryon trispinosus* (Krüger); Gt. Fish Bay, on *Geryon affinis* (Weltner).

*Poecilasma crassa* (Gray).

1848. *Anatifa crassa*. Gray, Proc. Zool. Soc. Lond., 1848, p. 44.

1851. *Poecilasma crassa*. Darwin, *loc. cit.*, p. 107, pl. ii, fig. 3.

1905. „ „ Gruvel, *loc. cit.*, p. 116, fig. 132.

1907. *Poecilasma inaequilaterale*, subsp. *breve*. Pilsbry, *loc. cit.*,  
p. 87, pl. vi, figs. 9, 10.

1922. „ *crassa*. Weltner, *Wiss. Erg. D. Tiefsee Exp.*,  
vol. xxiii, pt. 2, p. 78, pl. iv, fig. 17.

It is sometimes difficult to exclude the personal equation in matters of classification. In the description of the “Albatross” specimens of this genus, it seems to me that Pilsbry has been guilty of “false quantities” in separating *inaequilaterale* from *kaempferi* as a distinct species, while reducing *breve* to the rank of a subspecies of the former. Above, I have given reasons for regarding *inaequilaterale* as a variety of *kaempferi*; below, I offer reasons for uniting *breve* with *crassa*. Nilsson-Cantell (1921) unites both *inaequilaterale* and its variety *breve* with *kaempferi*.

Pilsbry had only 2 specimens, rather smaller than Darwin's, which are said to differ from *crassa* in the straight ocludent margin. This appears to be a variable character depending largely on the degree of asymmetry in the valves. The other point which might be thought to separate the two is the absence of lobes or teeth at the base of the carina. This absence is only presumed, since Pilsbry states that *breve* is “similar to *inaequilaterale*.” Whether or not such lobes are present in Pilsbry's specimens, their size and degree of development is a variable character, as shown by the present specimens.

A large number of specimens, associated with *kaempferi* on the same specimen of *Geryon quinquedens*, ranging from 2 mm. to 20 mm. in capitulum length; the largest, therefore, being considerably greater than Darwin's specimens.

They agree with Darwin's description. The surface lacks the wrinkly appearance characteristic of *kaempferi* (at least the S. African specimens of *kaempferi*), and is quite smooth, except for the radial and concentric striae. These near the base of the scuta are about equally strong, but towards the tergal and carinal margins the radial striae become far more prominent. A low rounded ridge runs from umbo to the apex of the scutum, and the “narrow depressed fissure-like line” found by Darwin in one of his specimens is here characteristic of all specimens above 9 mm. capitulum length; in smaller specimens it is sometimes traceable as a very faint groove, sometimes not at all. When it becomes distinctly developed it causes an angular notch in the tergal margin, and, as Darwin recognised, evidently shows how the divided scuta of *fissa*, etc., have been evolved.

Cirri as described by Darwin.

Caudal appendages about  $\frac{1}{2}$  length of peduncle of 6th cirrus, apically setose.

Penis moderately stout in its basal  $\frac{1}{5}$ , then suddenly widening to a width equal to length of 1st part, tapering gradually to a point on which is situated a dense tuft of setae; the whole penis has the appearance of a long narrow capitulum on a peduncle; it is transversely rugulose all over and setose towards the apex, the setae less numerous and shorter than in *kaempferi*.

*Length* of capitulum, 20 mm.; of peduncle, 10–13 mm. *Breadth*, 17 mm. *Width* (side to side), 12 mm.

*Locality*.—Cape Point, E. by N., distant 29 miles, 250–300 fathoms, many specimens, together with *P. kaempferi* on *Geryon quinquedens*. S.S. "Pieter Faure," 27/8/03. (S.A.M., No. A 3903.)

*Geogr. Distribution*.—Madeira, on *Homola cuvierii* (Darwin); Bohol, Philippine Islands (Gruvel); Azores, on *Cancer bellianus* (Gruvel); Gulf of Mexico, 463 fathoms, on *Bathyplox typhla* (Pilsbry: *breve*); Gt. Fish Bay, 12 fathoms (Weltner).

#### Gen. MEGALASMA Hoek.

- |       |                    |  |
|-------|--------------------|--|
| 1883. | <i>Megalasma</i> . | Hoek, Challeng. Rep., vol. viii, p. 50.                    |
| 1907. | "                  | Hoek, Siboga Exp. Monogr., 31A, p. 30.                     |
| 1907. | "                  | Pilsbry, Bull. U.S. Fish. Commiss., vol. xxvi,<br>p. 183.  |
| 1907. | "                  | Pilsbry, Bull. U.S. Nat. Mus., No. 60, p. 87.              |
| 1907. | "                  | Pilsbry, Proc. Ac. Nat. Sci. Philad., vol. lix,<br>p. 408. |
| 1909. | "                  | Annandale, Mem. Ind. Mus., vol. ii, pt. 2, p. 95.          |
| 1911. | "                  | Krüger, Beitr. Naturg. Ostas, p. 39.                       |

#### Key to the South African species.

1. Umbo at basal angle of scutum . . . (*Glyptelasma*) *carinatum* Hk.
2. Umbo above basal angle of scutum . . . (*Megalasma*) *minus* Annand.

#### Subgen. GLYPTELASMA Pilsbry, 1907.

##### *Megalasma carinatum* (Hoek).

- |       |                               |  |
|-------|-------------------------------|--|
| 1883. | <i>Poecilasma carinatum</i> . | Hoek, <i>loc. cit.</i> , p. 44, pl. i, figs. 8–10 ;<br>pl. ii, fig. 1 ; pl. vii, figs. 6, 7. |
| 1905. | "                             | Gruvel, Monogr. Cirrhip., p. 115,<br>fig. 130.   |
| 1907. | "                             | Hoek, Siboga Exp. Monogr., 31A,<br>p. 5, pl. i, fig. 1.                                      |

1908. *Megalasma carinatum*. Calman, Ann. Mag. Nat. Hist., ser. 9, vol. i, p. 401, text-figs. 1-3.

External characters as well as the mouth-parts, cirri, caudal appendages, and penis as described by Hoek. Owing to the condition of the specimens I can add nothing to Calman's account of the dorsal filamentous appendages.

It seems doubtful if *M. annandalei* Pilsbry, 1907, and *subcarinatum* Pilsbry, 1907, will prove to be distinct from this species.

*Length* of capitulum, 7.5 mm.; of peduncle, 2-3 mm. *Breadth*, 3.5 mm.

*Colour*.—White.

*Locality*.—Cape St. Francis, N.E., distant 29 miles, 75 fathoms, 1 specimen attached to *Octolasmis orthogonia*; East London, N.W.  $\frac{1}{2}$  N., distant 20 miles, 400-450 fathoms, 3 specimens on a dead Gorgonian stem. S.S. "Pieter Faure," 19/2/02 and 17/4/01. (S.A.M., Nos. A 281 and A 3927.)

*Geogr. Distribution*.—West Indies, 390 fathoms, and Ascension Is., 420 fathoms (Hoek); off Cuba, 600-900 metres (Gruvel); East Indies, 828-1633 metres (Hoek); Japan (Nilsson-Cantell).

Subgen. MEGALASMA s.s.

*Megalasma minus* Annand.

1906. *Megalasma striatum*, subsp. *minus*. Annandale, Ann. Mag. Nat. Hist. (7), vol. xvii, p. 399.  
 1907.     "          "          subsp. *minus*. Annandale, Illustr. Zool. Investig., "Cr. Entomotr.," pl. i, fig. 8.  
 1907. *Poecilasma bellum*. Pilsbry, Bull. Bur. Fish., vol. xxvi, p. 183, pl. iv, fig. 6.  
 1907. *Megalasma*     "          and *minus*. Pilsbry, Proc. Ac. Nat. Sci. Philad., vol. lix, p. 409, figs. 1-7.  
 1907.     "          *lineatum*. Hoek, Siboga Exp. Monogr., 31A, p. 31, pl. iv, figs. 1-8 (and footnote, p. 33, = *minus* Annand.).  
 1909.     "          *minus*. Annandale, Mem. Ind. Mus., vol. ii, pt. 2, p. 97.  
 1922.     "          "          Broch, Vidensk. Medd. naturh. For., vol. lxxiii, p. 273, fig. 31.

The above synonymy follows Annandale, and is based on an examination of 18 specimens ranging in size from 2.5 to 15 mm., all taken off the same specimen of sea-urchin.

Externally the specimens resemble Hoek's figures of *lineatum*, but the ridge on the scutum from the umbo to the occludent margin is rather stronger. The scutum is exactly twice as high as wide. The carina in the smaller specimens agrees with the figures of *lineatum* and *minus* given by Hoek and Pilsbry respectively. But as the specimens get larger there is a gradual obliteration of the median projection in the basal margin and a rounding off of the basal angles, until in the largest specimens the carina is indistinguishable from that of *bellum*. The fact that Pilsbry found this difference in shape "equally pronounced" in comparing specimens of *minus* from the Andaman Islands with young specimens of equal size of *bellum* from the Hawaiian Islands would seem to be outweighed by the present comparison of specimens *all from the same locality*.

In the second place the smaller specimens have 3 pairs, the larger ones 4 pairs, of spines on the joints of the cirri.

Moreover, the development of the teeth in the mandibles is variable and represents all stages between *bellum* and *minus*. A small accessory denticle may also be developed between the 2nd and 3rd, and between the 3rd and 4th primary teeth.

From this it appears that *bellum* and *minus* should be united.

The penis tapers gradually to a not very acute apex and is transversely rugulose and sparsely setose.

*Length* of capitulum, 15 mm.; of peduncle, 1-2 mm. *Breadth*, 5.5 mm.

*Colour*.—In spirit, white.

*Locality*.—S. Africa, label with the exact locality lost, 18 specimens attached to spines of a *Porocidar* sp. S.S. "Pieter Faure." (S.A.M., No. A 314.)

*Geogr. Distribution*.—Andaman Sea, 290-775 metres (Annandale : *minus*); Hawaiian Islands (Pilsbry : *bellum*); 5° 3' S., 119° E., 450 metres (Hoek : *lineatum*); Bay of Bengal (Annandale).

#### Gen. OCTOLASMIS (Gray).

1825. *Octolasmis*. Gray, Ann. Philos., vol. x, p. 100.

1851. *Dichelaspis*. Darwin, Monogr. Cirrip., p. 115.

1869. *Parodolepas*. MacDonald, Proc. Zool. Soc., 1869, p. 442.

1894. *Trichelaspis*. Stebbing, Ann. Mag. Nat. Hist. (6), vol. xiii, p. 443.

1894. *Dichelaspis*. Aurivillius, K. Sv. Vet. Ak. Handl., vol. xxvi, No. 7, p. 15.

1905. „ Gruvel, Monogr. Cirrhip., p. 123.

1907. *Dichelaspis*. Hoek, Siboga Exp. Monogr., 31A, p. 16.  
 1907. *Octolasmis*. Pilsbry, Bull. U.S. Nat. Mus., No. 60, p. 93.  
 1909. *Dichelaspis*. Annandale, Mem. Ind. Mus., vol. ii, pt. 2, p. 98.  
 1910. *Octolasmis*. Stebbing, Gen. Cat. S.A. Crust., p. 564.  
 1911. „ „ Krüger, Beitr. Cirrip. Ostas, p. 39.

*Key to the South African species.*

- I. Five valves.  
 A. Valves well developed, nearly completely covering the capitulum  
*tridens* (Aur.).  
 B. Valves more or less reduced, leaving bare spaces.  
 1. Basal branch of scutum large . . . . *warwicki* Gray.  
 2. Basal branch of scutum very narrow.  
     *a.* Tergum well developed, tridentate . . . . *weberi* (Hk.).  
     *b.* Tergum very small, semicircular . . . . *neptuni* (Mac.).  
 II. Three valves (terga absent) . . . . . *cor* (Aur.).

*Octolasmis tridens* (Auriv.).

1894. *Poecilasma tridens*. Aurivillius, *loc. cit.*, p. 14, pl. i, fig. 13.  
 1902. *Dichelaspis oclusa*. Lanchester, Proc. Zool. Soc. Lond., 1902,  
     ii, p. 373, pl. xxxv, figs. 6-6c.  
 1905. *Poecilasma tridens*. Gruvel, Monogr. Cirrip., p. 117, fig. 133.  
 1905. *Dichelaspis oclusa*. Gruvel, *ibid.*, p. 139, fig. 165.  
 1909. „ „ *tridens*. Annandale, *loc. cit.*, p. 107, pl. vii,  
     figs. 1, 2.  
 1922. *Poecilasma* „ „ Weltner, Wiss. Erg. D. Tiefsee Exp.,  
     vol. xxiii, pt. 2, p. 80, pl. iv, fig. 18.

This species forms the transition from the genus *Poecilasma* to the present genus.

Two specimens resembling most nearly Annandale's fig. 1.

*Length* of capitulum, 3 mm. ; of peduncle, 5 mm. *Breadth*, 2.5 mm.

*Colour*.—White, the thin cuticle covering the valves pale brown, peduncle translucent.

*Locality*.—Durban, 8 specimens on gills of *Scylla serrata* together with *O. cor* (K. H. B.). (S.A.M., No. A 4302.)

*Geogr. Distribution*.—Philippines (Aurivillius) ; Malay Archipelago (Lanchester) ; N. Sumatra, Bay of Bengal (Annandale). On *Macrophthalmus tomentosus*, mouth-parts of *Thenus orientalis*, gills of *Calappa exanthematosa*, base of chelae of *Xantho scaberrimus*. See Annandale, *loc. cit.*, 1909, p. 105.

*Octolasmis cor* (Auriv.).

1892. *Dichelaspis cor*. Aurivillius, Ofr. K. Sv. Vet. Ak. Forhl., No. 3, p. 124.  
 1894. „ „ Aurivillius, *loc. cit.*, p. 20, pl. ii, figs. 1, 2.  
 1902. „ *maindroni*. Gruvel, Arch. Mus. Paris, (4) iv, p. 282, pl. iv, figs. 21–27; pl. i, figs. 15, 16.  
 1902. „ *coutierei*. Gruvel, *ibid.*, p. 289, pl. iv, figs. 28–32.  
 1908. „ „ Annandale, Illustr. Zool. Investig., “Crust. Entomotr.,” pl. iv, figs. 4, 5.  
 1909. „ *cor*. Annandale, *loc. cit.*, p. 119, pl. vi, figs. 7–10.  
 1910. „ „ Stebbing, Gen. Cat. S.A. Crust., p. 565.

The specimens vary greatly in the shape of the basal portion of the scutum as shown in Annandale's figures (and also in those of *maindroni* given by Gruvel in 1905, Monogr. Cirrhip., p. 135, figs. 157, A–C).

Caudal appendages slightly exceeding the peduncle of 6th cirrus. Penis exceedingly swollen (perhaps due to undischarged spermatozoa), apex pointed with a tuft of setules, whole surface transversely sculptured but scarcely rugulose, near the apex some short setules and widely spaced little short recurved spinules.

*Length* of capitulum, 5 mm.; of peduncle, up to 12 mm. *Breadth*, 4 mm.

*Colour*.—In spirit, yellowish, the little chitinous granules dark brown; when fresh valves white, chitinous parts and peduncle slate colour, resembling that of the crab's gills.

*Locality*.—Kowie, 5 specimens on “gills of a crab”; Durban, numerous specimens on gills of *Scylla serrata* (K. H. B.). (S.A.M., Nos. A 275, A 4301.)

*Geogr. Distribution*.—Port Natal and Java (Aurivillius); East coast of Africa, Persian Gulf, Bay of Bengal, Sumatra (Gruvel). On gills of *Panulirus* sp. (Gruvel), *Scylla serrata* (Annandale). See also Annandale, *loc. cit.*, 1909, p. 106.

*Octolasmis warwicki* Gray.

1825. *Octolasmis warwicki*. Gray, *loc. cit.*, p. 100.  
 1830. „ „ Gray, Spicil. Zool., pl. vi, fig. 16.  
 1851. *Dichelaspis* „ Darwin, *loc. cit.*, p. 120, pl. ii, figs. 6, 6a, 6b.

1894. *Dichelaspis warwicki*. Aurivillius, *loc. cit.*, p. 15, pl. viii, figs. 26, 27.  
 1902. „ *equina*. Lanchester, Proc. Zool. Soc. Lond., 1902, pt. 2, p. 385, pl. xxxv, figs. 7, 7a-d.  
 1906. „ „ Annandale in Herdman's Ceylon Pearl Fish. Suppl. Rep., 31, p. 139, fig. 2.  
 1908. „ „ Annandale, Illustr. Zool. Investig., "Cr. Entomostr.," pl. v, figs. 4-6.  
 1909. „ *warwicki*. Annandale, *loc. cit.*, p. 110.

The caudal appendages, as stated by Aurivillius, increase in length proportionally to the peduncles of the 6th cirri as the individual gets older until they are of the length same as these. Also the number of groups of bristles in the joints of the cirri increases with age.

The shape of the basal portion of the scutum also seems to vary with age as described by Aurivillius. The terga in all the specimens have only 2 teeth.

The smallest specimen I have seen measures 1 mm., and has a distinct capitulum and peduncle with the valves already of the characteristic shape, both portions of the scutum being developed.

The *Cypris*-stage measures .75 mm. in length.

Penis very stout, distally tapering rapidly to a point, the distal quarter being recurved towards the ventral side, distal portion with long scattered setae and a tuft of setae on the apex, whole surface with very fine and regularly arranged transverse rugulae. No delicate terminal process, as mentioned by Annandale (*loc. cit.*, 1919, p. 111), was found.

*Length* of capitulum, 9 mm.; of peduncle, 10 mm. *Breadth*, 6 mm.

*Colour*.—In spirit, valves white, membrane pinkish.

*Locality*.—Tugela River, N. by W., distant 5 miles (Natal), 25 fathoms, several specimens on *Lupa sanguinolenta*; Amatikulu River, N.W. by W., distant 12 miles, 23 fathoms, several small specimens on the ventral surface and edges of antennae of *Thenus orientalis*. S.S. "Pieter Faure," 22/1/01 and 7/2/01. Durban, several specimens on *Scylla serrata* (K. H. B.). (S.A.M., Nos. A 310, A 4304, A 4305.)

*Geogr. Distribution*.—Widely distributed over the whole of the Indian Ocean. On Decapod Crustacea, Mollusca, Sea-snakes, Fishes, Antipatharians, *Limulus*. (See Annandale, *loc. cit.*, 1909, p. 105.)

*Octolasmis weberi* (Hk.).

1907. *Dichelaspis weberi*. Hoek, Siboga Exp. Monogr., 31A, p. 26, pl. iii, figs. 2-7.

On a preliminary examination I put these specimens into *O. orthogonia* (Darw.). But as Hoek has relied on the size and the shape of the terga and carinal disc for distinguishing his species from Darwin's, and as these specimens agree with *weberi* in the characters mentioned, I have decided to identify them with Hoek's species.

As regards size, these specimens are considerably larger even than Hoek's specimens of *weberi*, and consequently very much longer than *orthogonia*.

The 3 specimens are attached to what appears to be a slender Echinoderm spine about 15 mm. long. The peduncles are attached at one end, but the cement is decurrent to the other end, so that the spine is completely concealed and the 3 peduncles fused into one. The occludent margins are turned inwards to face one another.

Penis stout, of equal width throughout, apically blunt and setose, with a curved finger-like process, apically setulose, at the end of which open the united vasa deferentia. This presumably resembles the process described by Annandale (*loc. cit.*, 1909, p. 111) in *O. warwicki*, and which he thinks may be retractile.

*Length* of capitulum, 15 mm. ; of peduncle, 8 mm. *Breadth*, 9 mm.

*Colour*.—In spirit, valves white, membrane and peduncle pinkish.

*Locality*.—Cape St. Francis, N.E., distant 29 miles, 75 fathoms, 3 specimens. S.S. "Pieter Faure," 12/2/02. (S.A.M., No. A 280.)

*Geogr. Distribution*.—Malay Archipelago, 560 metres (Hoek).

*Octolasmis neptuni* (Macdonald).

1869. *Parodolepas neptuni*. Macdonald, Proc. Zool. Soc. Lond., 1869, p. 442, pls. xxxiii, xxxiv.

1905. *Dichelaspis* ,, Gruvel, Monogr. Cirrhip., p. 127, fig. 147.

Half a dozen specimens agreeing with Macdonald's description and figure. Although the present material only allows a comparison with *neptuni*, I feel certain that a larger series would necessitate *sinuata* Auriv., *trigona* Auriv., and *vaillantii* Gruvel, becoming synonyms.

Annandale has already united these last two with *sinuata* (1909, *loc. cit.*, p. 121), and remarked on the nearness of *sinuata*, *mülleri*

Coker, *aymonini* Lesson to one another and to *lowei* Darwin. In fact, Darwin's name will probably be made to cover all the other species mentioned above, including also *darwini* Filippi.

The concentric lines shown in Macdonald's figure are constant in all the present specimens.

*Length* of capitulum, 2 mm. ; of peduncle, 4 mm. *Breadth*, 1.5 mm.

*Colour*.—Translucent white.

*Locality*.—Durban, 7 specimens on the gills of *Scylla serrata*, together with *O. tridens* and *cor* (K. H. B.). (S.A.M., No. A 4303.)

*Geogr. Distribution*.—Australia and ? Fiji, on gills of *Neptunus pelagicus* (Macdonald).

#### Gen. CONCHODERMA Olfers.

- |         |                      |   |
|---------|----------------------|---|
| 1814 ?. | <i>Conchoderma</i> . | Olfers, Mag. Ges. Naturf. Fr. Berlin, viii (1818), 3rd Quart. (dated 1814), p. 177. |
| 1851.   | „                    | Darwin, Monogr. Cirrip., p. 136.  |
| 1905.   | „                    | Gruvel, Monogr. Cirrhip., p. 143.   |
| 1907.   | „                    | Pilsbry, Bull. U.S. Nat. Mus., No. 60, p. 98.                                       |
| 1909.   | „                    | Annandale, Mem. Ind. Mus., vol. ii, pt. 2, p. 79.                                   |
| 1910.   | „                    | Stebbing, Gen. Cat. S.A. Crust., p. 565.  |
| 1911.   | „                    | Krüger, Beitr. Cirrip. Ostas, p. 26 (Synonyms).                                     |

#### Key to the South African species.

1. Scutum bilobed. Tergum rudimentary or absent. Fleishy "ears" at apex of capitulum . . . . . *auritum* L.
2. Scutum trilobed. Tergum distinct. No "ears" . . . . . *virgatum* Spengler.

With regard to *C. auritum*, Pilsbry gives some notes on the colour and also coloured figures of Siberian specimens in Bull. Bur. Fish., vol. xxix, p. 71, pl. viii, figs. 5-7, 1911.

Both these barnacles grow attached to ships' bottoms, buoys, and the sessile barnacles (*Coronula*) on whales and turtles. They are never attached directly to the skin of these animals (see *Xenobalanus*).

An exception to this latter statement is found in the case of a small group of *virgatum*, together with young examples of *auritum*, which was taken off the tail of a large eel (*Gymnothorax favagineus*) caught at the Kowie. (S.A.M., No. A 4318.)

## Fam. ALEPADIDAE.

1851. *Lepadidae* (part). Darwin, Monogr. Cirrip., p. 8.  
 1905. *Anaspidae*. Gruvel, Monogr. Cirrip., p. 157.  
 1907. *Alepadinae* (subfam.). Pilsbry, Bull. U.S. Nat. Mus., No. 60,  
 pp. 3, 4.  
 1909. *Lepadidae* (*Lepadinae*). Annandale, Mem. Ind. Mus., vol. ii,  
 No. 2, p. 64.  
 1911. „ „ Krüger, Beitr. Cirrip. Ostas, p. 22.

## Gen. HETERALEPAS Pilsbry.

1851. *Alepas* (part). Darwin, *loc. cit.*, p. 156.  
 1907. *Heteralepas*. Pilsbry, *loc. cit.*, p. 100.  
 1909. „ Annandale, *loc. cit.*, p. 83.  
 1911. „ Krüger, *loc. cit.*, p. 29.  
 1922. „ Broch, Vidensk. Medd. Naturh. For., vol. lxxiii,  
 p. 279.

Krüger gives a list of the known species, distributing them among the 2 subgenera recognised by Pilsbry: *Heteralepas* s.s. and *Paralepas* Pilsbry, 1907. He places *lithotryae* Hk., 1907, and *morula* Hk., 1907, in *Heteralepas*, although Hoek expressly states that in *morula* the inner rami of 5th and 6th cirri are “as strongly developed as the outer rami,” and in *lithotryae* as in *intermedia* the inner rami are “slightly shorter” than the outer rami. Consequently I think *lithotryae* and *morula*, although in the latter the cirri are “long,” should more properly be assigned to *Paralepas*.

*Heteralepas* (*Paralepas*) *palinuri* n. sp.

Capitulum distinct from peduncle, ovate, dorsal (carinal) margin convex, rounded, without crest or keel, ventral margin less convex, orifice not protuberant or tubular, narrow, not crenulate.

Scuta absent, but their position marked by smooth patches. Surface smooth, with a few quite irregularly arranged wrinkles, probably due to method of preservation.

Peduncle long, narrow, cylindrical, not swollen below capitulum, not ringed, smooth.

Labrum with somewhat irregular teeth in the middle part of the crest, the lateral portions with feeble and obscure denticulations. Palps not meeting in middle, not very strongly setose.

Mandible with 4 sharp, entire, equal teeth (incl. the inner angle),

the lower margin of all set with a few small spinules, the interval between 1st and 2nd only slightly greater than the other intervals.

Maxilla with a conspicuous notch, the outer part with 2 strong unequal spines and a few spinules, the inner part with 2 strong spines (in the left, in the right maxilla only 1 is present), separated by a little notch, and numerous spinules.

Outer maxilla quadrate, with rounded angles.

Cirri short, very little curved, peduncles rather long, 5th and 6th not shorter than the preceding, rami of 5th and 6th cirri equally developed.

First cirrus, both rami 6-jointed, anterior slightly the longer, both with plumose setae.

Second and third cirri, outer ramus 14-, inner 13-jointed.

Fourth and fifth cirri, outer ramus 15-, inner 14-jointed.

Sixth cirrus, outer ramus 16-, inner 15-jointed.

Second to sixth cirri with a dense brush of short bristles on the anterior, 6 strong spines on the posterior apical margin of each joint.

Caudal appendages slender, 7-jointed.

Penis extending to end of 6th cirrus, tapering gradually, apex entire, subacute, distinctly ringed throughout, finely setose distally.

Length of capitulum, 22 mm.; of peduncle, 18 mm. Breadth, 15 mm.

Colour.—Alive, bright orange; in spirit, dirty white.

Locality.—Mozambique, November 1912 (K. H. B.), one ovigerous specimen attached to the buccal region of a *Panulirus* caught at low tide. (S.A.M., No. A 2223.)

## SESSILIA.

### Key to the South African families and subfamilies.

- I. Rostrum with radii. Labrum notched in the middle . . . *Balanidae*.
  1. Opercular valves together as large as orifice, scutum and tergum articulated together . . . . . s.f. *Balaninae*.
  2. Opercular valves together not nearly as large as orifice. Basis membranous. Compartments, 6.
    - a. Rostrum divided into 3 by fine sutures visible within. Walls very thick. On turtles, crabs, manatees . . . s.f. *Chelonibiinae*.
    - b. Rostrum undivided. Walls thin with deep folds. Scutum and tergum not articulated together. Sometimes absent. On Cetacea (non-South African species also on turtles, manatees, sea-snakes and fishes) . . . . . s.f. *Coronulinae*.

- II. Rostrum with alae, or when united with the rostral latera the composite compartment has overlapping lateral borders. Labrum concave, not notched . . . . . *Chthamalidae*.

No representative of the *Verrucidae* has yet been reported from South Africa.

#### Fam. BALANIDAE.

1854. *Balanidae*. Darwin, Monogr. Balanid., p. 33.  
 1905. *Balaninae*. Gruvel, Monogr. Cirrip., p. 209.  
 1911. „ Krüger, Beitr. Cirrip. Ostas, p. 46.  
 1916. *Balanidae*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, pp. 47, 48.  
 1922. „ Broch, Vidensk. Medd. Naturh. For., vol. lxxiii, p. 309.

#### Subfam. BALANINAE.

1854. *Balaninae*. Darwin, *loc. cit.*, p. 175.  
 1916. „ Pilsbry, *loc. cit.*, p. 49.

#### *Key to the South African genera.*

1. Compartments, 6.
  - a. Usually not spongicolous. Base usually flat. Compartments often stout, usually strongly connected . . . . . *Balanus*.
  - b. Spongicolous. Base cup-shaped or flat. Compartments thin, not porous, weakly connected . . . . . *Acasta*.
2. Compartments, 4 . . . . . *Tetraclita*.

As noted below under the genus *Acasta*, there are no definite criteria by which *Acasta* can be separated from *Balanus*.

#### Gen. BALANUS da Costa.

1778. *Balanus*. da Costa, Hist. Nat. Test. Brit., p. 248.  
 1854. „ Darwin, *loc. cit.*, p. 177.  
 1910. „ Stebbing, Gen. Cat. S.A. Crust., p. 567.  
 1913. „ Hoek, Siboga Exp. Monogr., 31B, p. 150.  
 1916. „ Pilsbry, *loc. cit.*, p. 49.  
 1921. „ Nilsson-Cantell, Zool. Bidrag. Upsala, vol. vii, p. 306.  
 1922. „ Broch, *loc. cit.*, p. 309.

*Key to the South African subgenera and species.*

1. Basis normally flat and attached throughout, not boat-shaped.
1. Parietes permeated with pores.
- a. Radii well developed, permeated with pores . . . s.g. *Megabalanus*.
- i. Apex of tergum acute but not beak-like.
- a. Usually large. Basal margin of scutum less than height  
*tininnabulum* L.
- β. Small. Basal margin of scutum greater than height  
*algicola* Pilsbry.
- ii. Apex of tergum produced, beak-like . . . *maxillaris* Gron.
- b. Radii not porous, rarely wanting . . . s.g. *Eubalanus*.
- i. Scutum with 1 or more longitudinal rows of pits. Tergum without  
groove . . . *trigonus* Darw.
- ii. Scutum without pits, but distinctly striate longitudinally  
*spongicola* Brown.
- iii. Scutum without pits and not striate or only very indistinctly so.
- a. Scutum with well-developed adductor ridge . *amphitrite* Darw.
- β. Scutum without (or with extremely feeble) adductor ridge.
- \* Basis not porous. White . . . *\*crenatus* Brug.
- \*\* Basis porous. Speckled and streaked with pink  
*poecilotheca* Krüger.
2. Parietes not porous.
- a. Basis calcareous.
- i. Scutum ridged between adductor scar and high articular ridge.  
Tergum without external furrow  
s.g. *Hesperibalanus elizabethae* n. sp.
- ii. Scutum not ridged. Tergum with external furrow or spur fasciole  
s.g. *Chirona tenuis* Hk.
- b. Basis membranous . . . s.g. *Membranobalanus oreutti* Pilsbry.
- II. Basis boat-shaped, only a small part attached . . . s.g. *Conopea*.
1. Parietes porous. . . *\*calceolus* Darw.
2. Parietes not porous. Adult greatly elongate, but neither rostrum nor  
carina touching the substratum . . . *scandens* Pilsbry.

Subgen. MEGABALANUS Hk.

1854. *Balanus* (sect. A.). Darwin, *loc. cit.*, p. 194.  
1913. *Megabalanus*. Hoek, *loc. cit.*, p. 158.  
1916.       "       Pilsbry, *loc. cit.*, p. 51.

*Balanus tintinnabulum* (Linn.).

1758. *Lepas tintinnabulum*. Linnaeus, Syst. Nat., ed. 10, p. 668.  
 1854. *Balanus* „ Darwin, Monogr. Balanid., p. 194,  
 pl. i, figs. *a-l*; pl. ii, figs. 1, *a-l*, *o*.

1897. *Balanus tintinnabulum*. Weltner, Arch. Naturg., p. 260.  
 1905. „ „ Gruvel, Monogr. Cirrhip., p. 211,  
 figs. 230–231.  
 1910. „ „ Stebbing, Gen. Cat. S.A. Crust.,  
 p. 567.  
 1913. „ „ Hoek, Siboga Exp. Monogr., 31B,  
 p. 164, pl. xiv, figs. 5, 7; pl. xvi,  
 figs. 16–19 (with new varieties).  
 1916. „ „ Pilsbry, Bull. U.S. Nat. Mus.,  
 No. 93, p. 54, pl. x, figs. 1, 1e,  
 2, 3; pl. xi, figs. 1, 1e, 2, 2e;  
 pl. xii, figs. 1, 1b, 2, 2b; pl. xiii,  
 figs. 1–2e; pl. xiv, figs. 1–3;  
 pl. xv, figs. 1–2d, 4; pl. xvi,  
 figs. 1, 1a, 2, 2a, 3; pl. xvii,  
 figs. 5–8; text-figs. 8–11 (with  
 new subspecies).

This species is cosmopolitan in distribution.

The following varieties are recorded from South Africa :—

var. *communis* Darwin.

(Pilsbry styles this form *B. tintinnabulum tintinnabulum* on the ground that *communis* was preoccupied.)

Small thin-shelled specimens from the bottom of the s.s. “Pieter Faure.” White or pinkish, striped with darker pink, radii white or pink, scutum with a pink stripe. Specimens 10 mm. in height and 8 mm. basal diameter are stated to be “three months’ growth.” (S.A.M., Nos. A 291, A 294.)

Large typical specimens off a ship from the Cameroons, previously from Europe, berthed and cleaned at Cape Town. (S.A.M., No. 327.)

var. *zebra* Darwin.

Recorded from Walfish Bay, S.W. Africa, by Weltner.

A few specimens of a small variety of this species were found on a specimen of *Coronula diadema* taken off a whale. In the conical shape and the small, oval, entire orifice they closely resemble var. *coccopoma*. Some show a slight longitudinal ribbing on the parietes, but this is quite obsolete in others. Those growing on the radii of the *Coronula* reproduce more or less distinctly the transverse striation. It seems inadvisable to name this form at present. (S.A.M., No. 1324.)

*Balanus algicola* Pilsbry.

1916. *Balanus algicola*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 72, pl. xii, figs. 3, 3g, text-figs. 12, 13.

Typical forms were taken from the bottom of s.s. "Pieter Faure," 15/4/98, after cruising for some months in Cape waters. They were associated with *maxillaris*.

Further typical examples were taken on *Mytilus* shells growing between tide-marks at Hout Bay, Cape Peninsula (11/2/14. K. H. B.).

A very depressed variety with rather strong ribs was taken at East London (s.s. "Pieter Faure," 3/7/01) at low tide on *Turbo sarmaticus*. The largest examples measure 4 mm. in rostro-carinal diameter and 1-1.5 mm. in height. Colour: pale pink, the ribs white. Except in shape and external sculpture these examples differ in no respects from the typical white tubulo-conical form. They may be designated var. *costatus* n.

Transitional forms between the typical form and the variety were found on a *Patella* shell at Kalk Bay, False Bay (G. Alston). (S.A.M., Nos. A 295, A 326, A 4239, and 1343 respectively.)

*Balanus maxillaris* Gronov.

1763. *Balanus maxillaris*. Gronovius, Zool. Gronov. Iconogr., vol. v, pl. xix, figs. 3, 4.

1790. *Lepas cylindrica*. Gmelin, Syst. Nat., p. 3213.

1854. *Balanus capensis*. Darwin, Monogr. Balanid., p. 209, pl. ii, figs. 4a, 4b.

1905. ,, ,, Gruvel, Monogr. Cirrhip., p. 218, figs. 238, 240.

1910. ,, ,, Stebbing, Gen. Cat. S.A. Crust., p. 568.

1916. ,, *maxillaris*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 77.

Stebbing attributes the species to Darwin, who first used the name *capensis* in a strictly binomial sense. I have no means of testing the validity of *Gronovius*' name, and, therefore, accept Pilsbry's pronouncement on this point.

Specimens are in the collection from Table Bay and from the bottom of s.s. "Pieter Faure." (S.A.M., Nos. 1342, A 289, A 295, and A 296.)

Subgen. EUBALANUS Broch.

1916. *Balanus* (da Costa). Pilsbry, loc. cit., p. 77.

1922. *Eubalanus*. Broch, loc. cit., p. 314.

*Balanus trigonus* Darwin.

1854. *Balanus trigonus*. Darwin, Monogr. Balanid., p. 222, pl. iii, figs. 7, *a-f*.
1867. „ *armatus*. F. Müller, Arch. Naturgesch., vol. i, p. 329, pl. vii, figs. 1-21, 23-28; pl. viii, figs. 44, 46-48; pl. ix, fig. 56.
1897. „ *trigonus*. Weltner, *ibid.*, 1897, p. 262, B. ii, 1.
1905. „ „ Gruvel, Monogr. Cirrhip., p. 223, figs. 248, 249.
1911. „ „ Krüger, Beitr. Cirrip. Ostas, p. 49, pl. i, fig. 6; pl. iii, fig. 33, text-figs. 98-100.
1913. „ „ Hoek, Siboga Exp. Monogr., 31B, p. 158 (note on systematic position).
1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 111, pl. xxvi, figs. 1-13e, text-figs. 27, 28.
1921. „ „ Nilsson-Cantell, Zool. Bidrag. Upsala, vol. vii, p. 319, fig. 66.
1922. „ „ Weltner, Wiss. Erg. D. Tiefsee Exp., vol. xxiii, pt. 2, p. 85.

Krüger has pointed out the presence of recurved teeth on the 3rd cirrus, and thinks that these forms which now possess armed cirri, like the present species, originally lived in sponges, since the claw-like spines are admirably adapted to keep the orifice free from the invading sponge, as was also noted by Fritz Müller. Further evidence that this explanation is correct he finds in the fact that *trigonus* sometimes lives in sponges at the present day. He reports several small specimens from Japanese seas in this habitat. At the Cape also a few small specimens were found quite embedded in a sponge.

In some of the examples examined there were 1-3 tiny upturned spines on the anterior ramus of the 4th cirrus as well as the claw-like spines on both rami of the 3rd cirrus, which are always present.

*Locality*.—Typical specimens are found all round the South African Coast from False Bay to Zululand, low-tide to 40 fathoms, attached to stones, shells, bases of Gorgonias, *Lepralia*-like Polyzoans, bottoms of ships, bases of horny sponges. The small specimens embedded in the loose horny sponge still contained the animals and thus had not been overgrown by the sponge after death. (S.A.M., Nos. A 296, A 3905, A 3918-3921, A 4273-4281, and A 4295.)

*Geogr. Distribution.*—Indo-Pacific, incl. Red Sea, Japan, California, Peru, East Indies, Australia, and New Zealand, Atlantic, West Indies, Brazil, Madeira, Azores, South Africa (Darwin, Gruvel, Krüger); Gt. Fish Bay (Weltner).

Additional habitats are sea-urchin spines (Gruvel) and Decapod crabs (Krüger).

The bathymetrical range appears to be very great, as specimens have been recorded from 150 metres (Krüger), 450 metres (Nilsson-Cantell), and even 3000 metres (Gruvel).

*Balanus spongicola* Brown.

- |       |                            |   |
|-------|----------------------------|---|
| 1827. | <i>Balanus spongicola.</i> | Brown, Illustr. Conch. Gr. Brit. and Irel., pl. vii, fig. 6.                                |
| 1844. | „ <i>spongicola.</i>       | Brown, <i>ibid.</i> , 2nd ed., pl. liii, figs. 14–16.                                       |
| 1854. | „ „                        | Darwin, Monogr. Balanid., p. 225, pl. iv, figs. 1, <i>a–d</i> .                             |
| 1905. | „ „                        | Gruvel, Monogr. Cirrhip., p. 225, fig. 251.   |
| 1910. | „ <i>spongicola.</i>       | Stebbing, Gen. Cat. S.A. Crust., p. 568.  |
| 1916. | „ <i>spongicola.</i>       | Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 115, pl. xxv, figs. 2, 3, 4–4c, text-figs. 29–31. |

The colour varies from uniform red or pink, through forms with the rostrum much paler or even white, to uniform white.

The 3rd or the 4th cirri may be armed with a few short upturned spines; if on the 3rd both rami are usually armed, if on the 4th only the anterior ramus; but they may be absent altogether on either one or the other cirrus.

Specimens attached to shells, corals, or embedded in sponges are tubulo-conical; some specimens attached to the outside of a hard siliceous sponge are much depressed.

*Locality.*—Saldanha Bay, and numerous localities round the South African Coast from False Bay to Zululand, low tide to 90 fathoms.

*Geogr. Distribution.*—Great Britain, Mediterranean, Madeira, West Indies, Cape of Good Hope (Darwin); La Guayra, Caracas (Weltner); Chagos, Seychelles (Gruvel); Patros Island, off Brazil (Pilsbry).

*Balanus amphitrite* Darwin.

- |       |                            |  |
|-------|----------------------------|--|
| 1789. | ? <i>Balanus radiatus.</i> | Bruguère, Encycl. Meth., p. 168.               |
| 1790. | ? <i>Lepas purpurea.</i>   | Spengler, Skr. Naturh. Selsk., vol. i, p. 172. |

1795. *Lepas balanoides*. Poli, Testac. Utr. Siciliae, p. 23, pl. v, figs. 2, 7 (*non* Linnaeus).  
 1815. „ *radiata*. Wood, Gener. Conch., pl. vii, fig. 7.  
 1854. *Balanus amphitrite*. Darwin, Monogr. Balanid, p. 240, pl. v, figs. 2-20.  
 1897. „ „ Weltner, Archiv. Naturg., p. 264.  
 1905. „ „ Gruvel, Monogr. Cirrhip., p. 232.  
 1907. „ *carenotus*. Gruvel, Mem. As. Soc. Beng., vol. ii, No. 1, p. 6.  
 1911. „ *amphitrite*. Krüger, Beitr. Cirrip. Ostas, p. 51.  
 1913. „ „ Hoek, Siboga Exp. Monogr., 31B, p. 167.  
 1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, pl. lxxxix (with subspecies).

Widely distributed in tropical and subtropical seas.

The following varieties have been discovered living in South African waters.

var. *communis*.

1854. Darwin, *loc. cit.*, p. 240, pl. v, figs. 2e, h, l.  
 1911. Krüger, *loc. cit.*, p. 57, pl. i, fig. 7 ; pl. iv, fig. 34.  
 1921. Nilsson-Cantell, Zool. Bidrag. Upsala, vol. vii, p. 311, fig. 64.

Several groups on various dead Lamellibranch shells, Umhloti River, N.W. by W.  $\frac{3}{4}$  W., distant 3 miles (Natal), 25 fathoms.

Several on the Rhizopod *Botellina pinnata*, Umhloti River, N.W., distant  $1\frac{1}{2}$  miles, 27 fathoms.

S.S. "Pieter Faure," 12/12/00 and 21/12/00. (S.A.M., Nos. A 293 and A 4238.)

var. *obscurus*.

1854. Darwin, *loc. cit.*, p. 241, pl. v, fig. 2g.

Several on *Siphonaria* shells, Port Beaufort, St. Sebastian Bay (C. A. Fairbridge).

On a shell of *Terebralia palustris*, Durban Bay (H. W. Bell-Marley).

On the aerial rootlets of mangrooves, Delagoa Bay (K. H. B.), October 1912. (S.A.M., Nos. 1350, A 3917 and A 316 respectively.)

\**Balanus crenatus* Brug.

1789. *Balanus crenatus*. Bruguère, Encycl. Meth. (Vers.), vol. i, p. 168.

1854. *Balanus crenatus*. Darwin, Monogr. Balanid., p. 261, pl. vi, figs. 6, *a-g*.  
 1910. „ „ Stebbing, Gen. Cat. S.A. Crust., p. 569.  
 1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 165, pls. xxxix-xl, text-figs. 49-54 (with new subspecies).  
 1921. „ „ Nilsson-Cantell, Zool. Bidrag. Upsala, vol. vii, p. 326.

Not represented in the collection.

This species has a very wide distribution in the Northern Hemisphere, and is recorded by Darwin and Gruvel from within and South of the Tropics. But Pilsbry is unwilling to accept these extensions until confirmed by further material.

*Balanus poecilotheca* Krüger.

1911. *Balanus poecilotheca*. Krüger, Beitr. Cirrip. Ostas, p. 48, pl. i, figs. 2, *c-e*; pl. iii, figs. 32, text-figs. 95-97.  
 1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 110.

Shell tubulo-conical when attached to other specimens, or depressed conical and laterally compressed when attached to the thin stems of Gorgonians and Hydroids.

One specimen of No. 4230, attached to a stem, is 8 mm. long  $\times$  4 mm. wide, only 4 mm. high, orifice very wide, opercular valves missing, lateral compartments keeled from apex to base near the rostral suture, rostrum concave, radii very wide, the pariete forming a narrow raised rib.

Upper lip with 1-3 teeth on either side of the notch, usually not symmetrically arranged.

Maxilla, about 6 spines between the 2 large outer ones and the 2 large inner ones, thus differing slightly from Krüger's description.

First cirrus, anterior ramus 13-jointed, basal joints protuberant and densely setose, posterior ramus 7-jointed, joints widened and densely setose.

Second cirrus, cirri not very unequal, 9- and 10-jointed, the joints broad and densely setose.

Third cirrus, rami subequal, ca. 11-jointed, distal anterior face of each joint in both rami with 2-5 short, minute conical teeth.

Fourth to sixth cirri, 20-24-jointed, each joint with 3 pairs of long setae and a shorter pair below them on the anterior margin.

Penis with a distinct basi-dorsal point.

*Length*.—Up to 8 mm. basal rostro-carinal diameter ; width, 5 mm. ; length of orifice, 5 mm. ; *height*, 6 mm.

*Colour*.—Pale pink, variously streaked and speckled with darker pink or crimson, the radii and rostrum occasionally pure white ; or the whole shell is white with the carina very faintly tinted pink.

*Locality*.—Numerous specimens from several localities from Cape Morgan to Durnford Point (Zululand), 25–85 fathoms. S.S. “Pieter Faure.” (S.A.M., Nos. A 4229–A 4237.)

*Geogr. Distribution*.—Japan (Krüger) ; Sulu Archipelago, 24–161 fathoms (Pilsbry).

I am indebted to Dr. Pilsbry for his opinion on this species which belongs to a “group of very critical species.” Dr. Pilsbry corrected my first belief that this was Hoek’s *B. amphitrite*, var. *malayensis*, by pointing out the difference in the armature of the cirri.

#### Subgen. *HESPERIBALANUS* Pilsbry.

1916. *Hesperibalanus*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 192.

#### *Balanus elizabethae* n. sp.

Shell low-conical, covered with a very thin almost colourless epidermis. Orifice pentagonal, only slightly notched.

Base unknown, but probably thin, as the rather fragile shell has not been injured in any way by removal from the object on which it was growing.

Parietes externally smooth, not porous, internally with regular, strong ribs extending up to the sheath, and crenulate at the base. Sheath very short, horizontally ribbed.

Radii broad, summits at 45° with base, the edges denticulate.

Alae broad, summits only slightly oblique.

Scutum thin, externally concave, with faint growth-lines about as far apart as in *hesperius laevidomus* Pilsbry ; basal margin considerably longer than tergal margin, articular ridge very prominent, adductor ridge faint, pit for depressor muscle obsolete.

Tergum rather thick, basal margin strongly concave between the prominent depressor-muscle crests and the spur, which is rather more than  $\frac{1}{4}$  basal width, subtruncate, distinct from basi-scutal angle, articular ridge prominent and overhanging the deep articular groove, external surface without groove or impressed lines, apex blunt and corroded, growth-lines fine and closer together than on scutum.

Labrum with 2 teeth on either side of notch. Palps as in *hesperius* Pilsbry.

Mandible, 1st-3rd teeth acute, less widely separated than in *hesperius nipponensis*, 4th and 5th rudimentary, obtuse, but distinctly removed from the subacute inner angle, lower edge setose.

Maxilla, inner edge straight, with 9 spines below the 2nd and the outer angle, which are very slightly larger than the rest.

First cirrus, anterior ramus 20-jointed, the lower 10 joints rather larger than the distal ones and slightly protuberant anteriorly, posterior ramus only  $\frac{1}{2}$  length of anterior, 10-jointed, very stout, half as broad as long, tapering distally, all the joints except the last 2 very broad and protuberant anteriorly.

Second cirrus, rami subequal, ca. 12-jointed, stout, all the joints broader than long and anteriorly protuberant, densely setose.

Third cirrus, rami subequal, anterior ca. 15-, posterior ca. 12-jointed, joints 2-7 of anterior ramus with a number of minute granules or tubercles on their anterior margins, posterior margins of joints 1 to about 9 very minutely spinulose, posterior ramus with the usual setae only, basal joint of anterior ramus swollen.

Fourth cirrus, rami subequal, 25-30-jointed, unarmed with spines, anterior margins of joints with 4 pairs of setae.

Fifth and sixth cirri, rami subequal, ca. 35-jointed, posterior margins of all the joints of both rami very minutely spinulose as in 3rd cirrus, anterior margin of each joint with 4 pairs of setae and a minute 5th pair below.

Penis longer than posterior cirri, sparsely setose.

*Length*.—Basal rostro-carinal diameter, 10 mm.; orifice, 5 mm.; height, 4 mm.

*Colour*.—White, translucent when wet.

*Locality*.—Zwartkops River (tidal), Port Elizabeth, 3 specimens (Mrs. T. V. Paterson, 1913). (S.A.M., No. 2255.)

This form is evidently closely allied to *hesperius* Pilsbry, 1916, especially to the Japanese form *nipponense*. The characters of *nipponense* appear to have been further developed, as instance the shape of the opercular valves. The 1st cirrus, however, is very characteristic of the new species.

#### Subgen. *CHIRONA* Gray.

1835. *Chirona*. Gray, Phil. Tr. Roy. Soc., 1835, pt. 1, p. 37.

1913. *Striatobalanus*. Hoek, Siboga Exp. Monogr., 316, p. 159.

1916. *Chirona*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 203.

*Balanus tenuis* Hk.

1883. *Balanus tenuis*. Hoek, Challeng. Rep., vol. viii, p. 154,  
pl. 13, figs. 29–33.  
1905. „ „ Gruvel, Monogr. Cirrhip., p. 247, fig. 275.  
1913. „ „ Hoek, Siboga Exp. Monogr., 31B, p. 190,  
pl. 17, figs. 14–19; pl. 18, fig. 1.  
1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 216.

The largest specimen measures 18 mm. in rostro-carinal diameter and 7 mm. in height. It is attached to a dead shell of *Neptuneopsis gilechristi* Sow. Other smaller specimens with the same proportions attached to *Cassia achatina*.

Another specimen, attached to *Oniscia macandrewi*, is more tubulo-conical, being 10 mm. in height and 9 mm. in rostro-carinal diameter.

They agree with Hoek's description. The tergum has the scutal margin either straight or slightly concave. Contrary to Gruvel's statement I find there is a very distinct basi-dorsal point on the penis in the one specimen which contains the animal.

*Colour*.—Creamy-white.

*Locality*.—Nanquas Peak, N. by E.  $\frac{1}{4}$  E., distant 10 miles, 59 fathoms, 2 specimens; Cape Natal, W. by N., distant 4 miles, 47 fathoms, 1 specimen; Cape Natal, N.  $\frac{1}{2}$  W., distant, 4 miles, 55 fathoms, several specimens. S.S. "Pieter Faure," 3/12/01, 14/12/00, and 24/12/00. (S.A.M., Nos. A 309, A 4271, and A 4272.)

*Geogr. Distribution*.—Philippine Islands, 100–115 fathoms and 275 metres (Hoek); Philippine Islands and China Sea, 102–244 fathoms (Pilsbry).

## Subgen. MEMBRANOBALANUS Hk.

1913. *Membranobalanus*. Hoek, Siboga Exp. Monogr., 31B,  
pp. 159–205.  
1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93,  
p. 229.

*Balanus orcutti* Pilsbry.

1907. *Balanus orcutti*. Pilsbry, Proc. Ac. Nat. Sci. Philad., p. 361,  
pl. xxix, figs. 1–7.  
1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93,  
p. 233, pl. lv, figs. 2–2d.

Agrees well with Pilsbry's description. The walls show irregular growth-lines which are seen most distinctly on the rostrum. The

rostrum is twice as long as the other compartments, with no trace of a longitudinal groove and not tapering so strongly as in *longirostrum* Hoek, 1913, interior with several irregularly arranged, longitudinal, more or less parallel grooves. Lateral compartments twice as wide as carino-laterals. Carina only a little longer than the carino-laterals and laterals. Sheath horizontally ridged, with a brown setose membrane.

Scutum and tergum as described by Pilsbry, also covered with brown setose membrane.

Labrum with a rather wide and not very deep notch, 2 teeth on either side and a setulose margin. Palp elongate, apically upturned, upper margin concave (as in *longirostrum* Hk.).

Mandible similar to that of *longirostrum*, 1st, 2nd, and 3rd teeth well developed, 4th rudimentary, 5th obsolete, inferior angle subacute, distance between 1st and 2nd greater than that between 2nd and 3rd.

Maxilla, inner margin straight, about 8 spines between the outer and inner pairs.

Outer maxilla as in *longirostrum*.

First cirrus with stout, very unequal rami, the anterior 25-jointed, the posterior 8-jointed, with the joints protuberant on the anterior faces.

Second cirrus with slightly unequal rami, 12- and 13-jointed, joints not very protuberant.

Third cirrus with slightly unequal rami, 16- and 18-jointed, without stout spines.

Fourth cirrus with slightly unequal rami, 20- and 32-jointed, joints 1-12 of the anterior ramus with 3-5 short, stout upwardly directed spines on anterior apices, joints 3-12 in addition with 2-4 stout, recurved spines, anterior apices of 1st and 2nd joints of pedicel with a row of stout, upwardly directed spines, those on first joint smaller and more numerous.

Pedicels of 4th-6th cirri very long. Rami of 5th and 6th cirri subequal, ca. 32-35-jointed, without stout spines.

Penis very long, 15 mm., transversely rugulose, with scattered setae and minutely bifid apex.

*Length* of rostrum of largest specimen, 13 mm.; of carina, 8 mm.; rostro-carinal basal diameter, ca. 13 mm.

*Colour*.—White, the membrane covering the sheath, terga, and scuta deep yellowish-brown.

*Locality*.—Algoa Bay, 26 fathoms, 4 specimens in a horny sponge. S.S. "Pieter Faure," 6/12/98. (S.A.M., No. A 3922.)

*Geogr. Distribution*.—California (Pilsbry).

Darwin's *declivis* is found in the West Indies and Hoek's *longirostrum* in the Malay Archipelago. All three species are closely allied.

In the original description an evident *lapsus calami* occurs by which both in the text and in the explanation to plate "carina" and "rostrum" are transposed. This is corrected in the 1916 description.

Subgen. CONOPEA Say.

1822. *Conopea*. Say, Journ. Ac. Nat. Sci. Philad., vol. ii, p. 323.

1854. *Balanus* (sect. B.). Darwin, Monogr. Balanid., p. 216.

1913. *Patellabalanus*. Hoek, Siboga Exp. Monogr., 31B, pp. 160–221.

1916. *Conopea*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 234.

1922. „ Broch, Vidensk. Medd. Naturh. For., vol. lxxiii, p. 325.

*Balanus scandens* Pilsbry.

1916. *Balanus scandens*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. lvi, pl. 56, figs. 2–2d, text-fig. 76.

1921. „ „ Nilsson-Cantell, Zool. Bidrag. Upsala, vol. vii, p. 334.

Shell elongate in the rostro-carinal axis, sitting obliquely on the Gorgonian stem and attached only by the lower central part of the base. Whole shell completely covered by the coenenchyma and polyps of the Gorgonian. Epidermis thin, golden-brown.

Base compressed conical, no basal furrow, solid, internally smooth except around the periphery where short ribs are developed corresponding with those on the walls. An angle between the walls and the base. The upper edge of the basal cup and the lower edge of the walls do not meet closely, but leave a narrow space between, which is cut up into a series of little square pores by the internal ribs which are continuous from the walls to the base. This space is, of course, covered by the epidermis externally.

Parietes not porous, externally smooth, internally ribbed at the base; sheath very long, slightly ribbed horizontally. Carina and rostrum strongly elongate, not touching the stem. The internal cavity does not extend along the prolongations, which are thus solid. Carino-laterals about  $\frac{1}{3}$  width of laterals. Radii well developed, horizontally striated, not deeply sunk, summits parallel with base.

Alae with summits horizontal or slightly oblique. Sutural edges distinctly crenated.

Scutum high and narrow, outer surface only with growth-lines which are strongly marked and form strong teeth on the occludent margin, articular ridge prominent, obliquely truncate below, adductor ridge obsolete, pit for depressor muscles shallow, a series of faint interrupted, short, longitudinal ridges near the apex, basal margin not strongly convex, basi-tergal angle not much rounded off.

Tergum with scutal margin slightly concave, carinal margin convex, apex acute, shortly projecting, apical angle less than a right angle, growth-lines well marked, no longitudinal striae, a spur fasciole, but no groove or impressed lines, articular ridge not prominent, crests for depressor muscles distinct, a series of interrupted ridges near the apex as in the scutum, spur very short, half basal width, entirely confluent with the basi-acutal angle, which is rounded, and sloping into the basal margin on the carinal side.

Labrum with 3 very minute teeth on each side. Palps as in *scandens* Pilsbry.

Mandible with 5 distinct teeth, 4th and 5th small, 2nd, 3rd, and 4th bifid, the secondary edge on the 4th being crenulate, inner angle squarely truncate.

Maxilla, inner edge straight, 5 spines between the 2 outer and 2 inner enlarged ones.

First cirrus, rami unequal, anterior 10-jointed, posterior 6-jointed, 4 joints of which are protuberant.

Second cirrus, rami unequal, anterior 10-jointed, posterior 8-jointed, all the joints (except the apical ones) protuberant.

Third cirrus, rami unequal, anterior 12-jointed, posterior 10-jointed, anterior ramus with a few short upturned spines on the protuberant anterior margins of the joints.

Fourth cirrus, rami subequal, ca. 20-jointed, unarmed with spines, joints with 3 pairs of setae.

Fifth and sixth cirri, rami subequal, ca. 22-jointed, unarmed with spines, joints with 3 pairs of setae and a minute 4th pair of setules below.

Penis 3 times length of posterior cirri, transversely rugulose, sparsely setose, with a well-marked basi-dorsal point.

After having drawn up the above description based on a single individual and decided to make it a new species, further specimens were discovered bearing the same number and growing on the same Gorgonian as the first specimen. An animal from one of these differed in no respect from the above description except in lacking the basi-

dorsal point on the penis. Thus it agrees almost down to the minutest details with Pilsbry's description of *scandens*.

On the characters of the opercular valves also these latter specimens cannot be distinguished from the one first described nor from *scandens*. But in the shape of the shell this specimen approaches Hoek's figure of *investitus*, except that the rostrum is raised farther from the supporting stem.

Even had one regarded the greatly elongate form as an older stage than the moderately elongate form, one would not have ventured to assign them to *scandens*. By a fortunate chance, however, on the same stem next to one of the specimens resembling *investitus* there sits a specimen which is exactly like Pilsbry's figure of *scandens*. Moreover, this specimen contained the animal, which on examination proved to differ in no respect from the above description; the basidorsal point on the penis is present.

Excluding this last character and the presence of the faint interrupted ridges on the interior of the scuta and terga, neither of which seem to me to be really important, we see there is no reason against assigning all these specimens to Pilsbry's species.

Pilsbry had only 1 specimen from which to draw up this diagnosis, the actual size of which we are not told. But it was not very large. I regard it as a juvenile. The Cape specimen in the same stage measures in rostro-carinal diameter 5 mm., total height, 5 mm. The next stage is represented by the form resembling *investitus*, the corresponding measurements being 7 mm. and 5.5 mm. After this the rostrum and carina and those portions of the base opposed to them begin to elongate. The elongations, as noted above, do not include extensions of the central cavity, they are quite solid. This stage, represented by the single specimen described above, measures as follows: rostro-carinal length, 17 mm.; orifice, 3 mm.; height of shell, 5 mm.; of shell plus base, 8 mm.

*Colour*.—Pale pinkish, radii white, epidermis golden-brown.

*Locality*.—O'Neil Peak, N.N.W.  $\frac{1}{4}$  W., distant 8 miles (Zululand), 55 fathoms. S.S. "Pieter Faure," 28/2/01, 1 adult, 3 half-grown, 1 juv., on *Villogorgia mauritiensis*, associated with *B. poecilotheca* Krüger. The coenenchyma and the polyps completely cover up the shell, and the axis of the Gorgonian appears to swell out around the point of attachment of the base, thus tending to make the attachment all the more secure. (S.A.M., No. A 4228.)

*Geogr. Distribution*.—Japan, 65–125 fathoms (Pilsbry and Nilsson-Cantell).

Gen. *ACASTA* Leach.

1817. *Acasta*. Leach, Journ. de Physique, vol. lxxxv.  
 1854. „ (subgen.). Darwin, Monogr. Balanidae, p. 302.  
 1905. „ Gruvel, Monogr. Cirrhip., p. 258.  
 1906. „ Annandale in Herdman's Ceylon Pearl Fish. Suppl.  
 Rep., xxxi, p. 145.  
 1911. „ Krüger, Beitr. Cirrip. Ostas, p. 56.  
 1912. „ Pilsbry, Proc. U.S. Nat. Mus., vol. xlii, p. 294.  
 1913. „ Hoek, Siboga Exp. Monogr., 31B, p. 232.  
 1916. „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 241.  
 1921. „ Nilsson-Cantell, Zool. Bidrag. Upsala, vol. vii, p. 341.  
 1922. „ Broch, Vidensk. Medd. Naturh. For., vol. lxxiii,  
 p. 330.

Darwin made this a subgenus of *Balanus* because he found it impossible to fix on any character by which the *Acasta*-forms could be separated from the *Balanus*-forms, even the habitat not being conclusive.

Darwin knew of one *Acasta* species, *purpurata*, which did not live in sponges. Since then Annandale has described a species, *funiculorum*, which is attached openly to the surface of a coral.

If any further fact were needed to break down all distinctions between *Balanus* and *Acasta*, it is furnished by the species described below which has a membranous base, thus agreeing with the species of *Membranobalanus*.

But since Darwin's time authors have considered *Acasta* as of generic rank, mainly for the sake of convenience and on account of the unmistakable *facies* which all the species possess.

*Key to the South African species.*

I. Base calcareous.

A. Tergum without a proper groove from apex to spur.

1. No gaps at the bases of the parietes.

a. Base cup-shaped (nearly always). Radii not as wide as parietes.

i. Outer surface with short rigid projections. Base often porous . . . . . *spongites* (Poli).

ii. Outer surface with long flexible projections  
*sulcata* Darw., var. *anchoris* n.

b. Base more or less flattened. Radii wider than parietes  
*cyathus* Darw.

2. Small gaps at the base of the parietes . . . . . *alba* n. sp.

B. Tergum with a distinct and well-marked groove.

1. No gaps at bases of parietes. Base flat. Tergum not cancellate  
*fossata* n. sp.
2. Small gaps at bases of parietes (at least in the adult). Base cup-shaped. Tergum cancellate . . . *pectinipes* Pilsbry.

II. Base membranous, sometimes feebly calcified round the edges in the adult  
*membranacea* n. sp.

*Acasta spongites* (Poli).

1791. *Lepas spongites*. Poli, Testac. Utriusque Siciliae, vol. i, p. 25, pl. vi, figs. 3-6.
1854. *Acasta* ,, Darwin, *loc. cit.*, p. 308, pl. ix, figs. 1, a-d.
1905. ,, ,, Gruvel, *loc. cit.*, p. 263, fig. 293.
1910. ,, ,, Stebbing, Gen. Cat. S.A. Crust., p. 570.
1911. ,, ,, subsp. *japonica*. Pilsbry, Bull. Bur. Fish., vol. xxix (1909), p. 80, pl. xvi, figs. 1-9.
1916. ,, ,, and *japonica*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, pp. 242, 243, text-figs. 77, 78.

- a. Carino-lateral parietes about  $\frac{1}{3}$  width of lateral parietes . . . *forma typica*.
- b. Carino-lateral parietes  $\frac{1}{2}$  width of lateral parietes . . . subsp. *japonica*.

There are four lots. The specimens in the first lot have 4 rows of pores, 1 from centre to each carino-lateral pariete and 1 to each of the sutures between the rostrum and the lateral parietes. The row to the carino-lateral pariete is really double and sometimes the two rows are distinct, making 6 rows of pores in all.

In the second lot there are some specimens with the base nearly wholly porous, others in which the lower part is porous and the upper part solid, either with or without 4 or 6 rows of pores as described above. The base also is sometimes nearly flat (*cf.* figure of *scuticosta* Weltner), in others very deep, even deeper than the height of the shell, 15 mm., 9 mm.

The third lot have rather shallow, non-porous bases.

The fourth lot closely resembles the subsp. *japonica*. It has, however, the partly, or almost wholly perforated base characteristic of the typical Cape form. Base often very deep and curled to one side. Fourth cirrus with anterior margins of all the joints of *both* rami and both margins of the 2nd joint of the pedicel scabrous with minute spinules, as described by Darwin, but apparently more numerous. Only 3 pairs of setae on the joints of the 6th cirrus.

The first 3 lots were all in an open horny sponge, but the 4th lot were embedded in a soft slimy species of sponge.

Pilsbry, in 1916, has separated the Japanese form specifically. In view of the porous base of the Cape specimens, which link them on to the typical form, I prefer to regard it as a subspecies.

*Colour*.—White, yellowish, or pinkish.

*Locality*.—33° 6' S., 28° 11' E. (off East London), 85 fathoms; Umhloti River, N. by W.  $\frac{1}{2}$  W., distant 8 miles (Natal), 40 fathoms; Durnford Point, N.W.  $\frac{3}{4}$  W., distant 12 miles (Zululand), 90 fathoms; Umkomaas River, N.W. by W.  $\frac{1}{2}$  W., distant 5 miles (Natal), 40 fathoms. S.S. "Pieter Faure," 28/1/99, 18/12/00, 28/2/01, and 3/12/00. (S.A.M., Nos. A 4112-15.)

*Geogr. Distribution*.—North Atlantic, Mediterranean, Cape of Good Hope (Darwin); Red Sea, Persian Gulf (Gruvel); Japan, 103 fathoms (Pilsbry) (subsp. *japonica*).

*Acasta sulcata*, var. *anchoris* n.

(Plate I, fig. 16.)

- |       |                         |   |
|-------|-------------------------|---|
| 1818. | <i>Acasta sulcata</i> . | Lamarck, Anim. Sans. Vertebr.                                     |
| 1831. | " "                     | Deshayes in Guérin. Mag. de Zool., pl. xxiv.                      |
| 1854. | " "                     | Darwin, <i>loc. cit.</i> , p. 310, pl. ix, figs. 2, <i>a-d</i> .  |
| 1897. | " "                     | Weltner, Arch. f. Naturgesch., 1897, Bd. i.                       |
| 1905. | " "                     | Gruvel, <i>loc. cit.</i> , p. 263, fig. 294.                      |
| 1911. | " "                     | Krüger, <i>loc. cit.</i> , p. 56, pl. i, fig. 9; pl. iv, fig. 40. |

Darwin recognised 2 varieties, but without giving them names. The present form is so distinct that I think it deserves a name.

Subglobular. Walls slightly converging. Orifice not very large, deeply notched.

Base variable, irregularly cup-shaped, depth variable, oval, with the centre always to one side, usually nearest the carinal edge, but in one case nearer the animal's right side, in one specimen very deep and so strongly curved that the centre points in the same direction as the orifice. Lines of growth distinct, especially on the outer side where the growth is greatest; edge crenulate, no internal teeth.

Walls externally smooth, with (typically) rather long, calcified but flexible filamentous projections; these vary much in development, being sometimes short or even absent altogether except for 2-3 short ones on the carina.

Parietes internally ribbed, apices incurved. Carino-lateral pariete

narrow,  $\frac{1}{6}$  as wide as lateral pariete, reaching to base, ala and radius both reaching to base, both a little wider than the pariete, with very oblique summits. No slits at base.

Scutum, basal margin not greatly longer than tergal margin, articular ridge well developed, not terminating abruptly below, adductor ridge and cavities for depressor muscles feeble, surface with growth-ridges only, the longitudinal striae obsolete.

Tergum slightly beaked, scutal margin slightly concave, about equal to basal margin, spur short, about  $\frac{1}{3}$  basal width, articular ridge feeble, depressor crests obsolete, surface with growth-ridges only, a very slight, broad, longitudinal depression increasing in width towards the spur.

Labrum with 3 denticles on inner apex, palps obliquely truncate.

Mandible, 3rd tooth double, 4th and 5th rudimentary, inner angle with 2 minute denticles and setose on inner margin.

Maxilla, inner edge quite straight, with 9-10 subequal spines, the outer and inner ones not larger than the others.

First cirrus, rami very unequal, 7- and 19-jointed.

Second cirrus, rami slightly unequal, 8- and 10-jointed.

Third cirrus, rami subequal, 9-jointed, unarmed.

Fourth cirrus, rami equal, 10- and 11-jointed, 2nd joint of peduncle with 9 stout recurved teeth on anterior margin, anterior ramus with 2 recurved teeth on joints 1 and 2, 2-4 on joints 3 and 4, and 1-2 on joint 5.

Fifth and sixth cirri, rami 15-18-jointed, with no trace of recurved teeth or spines, 3 pairs of setae on anterior margin and apical pair on posterior margin.

Penis longer than posterior cirri, setulose, strongly rugulose, apex subacute.

*Length* of shell, 3 mm.

*Colour*.—White.

*Locality*.—Tugela River, N.W. by W., distant 3 miles (Natal), 14 fathoms, 6 specimens. S.S. "Pieter Faure," 16/1/01. (S.A.M., No. A 4209.)

*Geogr. Distribution*.—West Australia (Lamarek); South Australia and N.S. Wales (Darwin); Philippines (Weltner); Japan, 15-22 metres (Krüger).

*Acasta cyathus* Darwin.

1854. *Acasta cyathus*. Darwin, *loc. cit.*, p. 312, pl. ix, figs. 3, *a-c*.

1905. „ „ Gruvel, *loc. cit.*, p. 259, fig. 287.

1906. *Acasta cyathus*. Annandale, *loc. cit.*, p. 144.  
 1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 244,  
 pl. lvii, text-figs. 79, 80.  
 1922. „ „ Weltner, Wiss. Erg. D. Tiefsee Exp., vol.  
 xxiii, pt. 2, p. 85.

One specimen resembles *cyathus* in all respects except that the base is distinctly, though not deeply, cup-shaped.

Scutum with faint longitudinal striae. Tergal spur more rounded below. Another specimen resembles the typical *cyathus* in the structure of the walls and the valves, but the 4th cirrus has only 2-3 little upturned spines on the anterior apices of the lower 8 joints of the anterior ramus. Maxilla with inner edge straight, the 2 large outer spines followed by 7 smaller ones. Scutum and tergum with growth-lines only. Base small and flat. Parietes with a few rather long, spiniform projections.

Both specimens in an open horny sponge.

*Length*.—Nine mm.

*Colour*.—White.

*Locality*.—Durnford Point, N.W.  $\frac{3}{4}$  W., distant 12 miles (Zululand), 90 fathoms; Umtwalumi River, N. by W., distant 7 miles (Natal), 50 fathoms. S.S. "Pieter Faure," 28/2/01 and 11/3/01. (S.A.M., Nos. A 4210 and A 4211.)

*Geogr. Distribution*.—Madeira, West Indies (Darwin); New South Wales (Gruvel); Ceylon (Annandale); West Indies, Florida, Colon (Pilsbry); Dar-es-Salaam (Weltner).

#### *Acasta alba* n. sp.

A species that is almost exactly a combination of *A. fenestrata* and *A. purpurata*, approaching perhaps nearer to the latter.

It resembles *purpurata* in general form, the size of the slits, the ribbed interior of the parietes, and the hollowing out of the parietes only on one side, and in the crenated edge of the basal cup, but has the oblique summits of the radii and the scutum and tergum of *fenestrata*.

The basal cup is not quite so deep as in Darwin's figure of *purpurata*. Carino-lateral pariete  $\frac{1}{2}$  width of the lateral pariete. Radii not as wide as their parietes.

Scutum with growth-ridges only, articular ridge distinct, oblique below, adductor ridge and pits for adductor and depressor muscles faint.

Tergum resembling that of *fenestrata*, but not "furrowed in the line of the spur," with growth-ridges only, spur  $\frac{1}{2}$  width of basal margin, distinct from basi-scutal angle, articular ridge not prominent, depressor crests obsolete.

Labrum, palps obliquely truncate, outer apical angles subacute.

Mandible, 2nd, 3rd, and 4th teeth double, 5th small, but distinct; inner angle bifid more distinctly so on the one side than on the other.

Maxilla, inner edge quite straight, 6-7 spines following the 2 outer ones and increasing in size to the 2 inner ones which are nearly equal to the 2 outer ones.

First cirrus, posterior ramus 16-jointed, twice as long as 6-jointed anterior ramus.

Second cirrus, posterior 11-jointed, ramus slightly longer than 8-jointed anterior ramus.

Third cirrus, rami subequal, 13-jointed, unarmed.

Fourth cirrus, rami subequal, 17-jointed, 2nd joint of peduncle with 2 recurved teeth and 2 minute denticles on anterior apical angle, anterior ramus with 2-3 unequal recurved teeth on joints 1-7, 1 tooth on joint 8.

Fifth and sixth cirri unarmed, each joint with 3 pairs of setae on anterior margin.

Penis longer than posterior cirri, setulose, and rugulose.

*Length* of shell, 4 mm. ; of basal cup, 1.5 mm. ; greatest diameter, 4 mm.

*Colour*.—Uniform white in spirit.

*Locality*.—33° 9' S., 28° 3' E. (off East London), 47 fathoms, 1 specimen; 33° 6' S., 28° 11' E. (off East London), 85 fathoms, 1 specimen; Scottburgh, N.W. by N., distant 8 miles (Natal), 92 fathoms, 1 specimen. S.S. "Pieter Faure," 28/12/98, 28/1/99, and 7/3/01. (S.A.M., Nos. A 4216-8.)

#### *Acasta fossata* n. sp.

More or less conical, slightly narrowing above, widest at base. Orifice large, not very deeply notched. Walls externally with growth-lines and numerous small, short points. Radii as wide as or a little narrower than their parietes, summits not very oblique, with faint horizontal and oblique striae. No gaps. Parietes internally strongly ribbed, the lateral margins thickened and projecting inwards. Sheath horizontally ribbed. Carino-lateral pariete  $\frac{1}{2}$  width of lateral pariete.

Base saucer-shaped, very shallow or quite flat, oval more or less

distinctly hexagonal, thick, externally with growth-lines, internally with 6 more or less distinct, never prominent, radiating ridges, each thickened into a tooth at the periphery, but not bifid.

Scutum thick, high, and narrow, basal margin much the shortest, slightly convex, outer surface with growth-ridges densely covered with a short thick pile, articular ridge prominent, oblique below, adductor ridge prominent, pits for adductor and depressor muscles distinct.

Tergum short, not so thick as scutum, carinal margin shortest, a wide and deep groove running to spur, which is nearly equal to, sometimes quite equal to, half basal width, rounded below, basiscutal angle usually distinct but sometimes confluent with spur, surface with growth-ridges covered with a short dense pile, articular ridge not very distinct, depressor crests distinct, in fact nearly the whole of the inner surface has a number of small irregular, often interrupted, ridges.

Mandible, 2nd and 3rd teeth obscurely double, 4th distinct, 5th scarcely distinct from blunt inner angle.

Maxilla, inner edge with a shallow notch, with 3-4 small spinules in it, followed by 8 spines of which 2 near the inner angle are as large as the 2 on outer angle.

First cirrus, posterior 16-jointed ramus twice as long as 8-jointed anterior ramus, the joints of which are lobed posteriorly.

Second cirrus, anterior 10-jointed ramus slightly longer than 8-jointed posterior ramus.

Third cirrus, rami subequal, 14-jointed, 5-6 little upturned spines on both rami, but stronger on the anterior.

Fourth cirrus longer, but with similar armature.

Fifth cirrus, joints of the anterior ramus with 2-3 spinules, rather indistinct.

Sixth cirrus unarmed. Joints of 5th and 6th cirri with 3 pairs of setae on anterior margin and 1 pair on posterior apex.

Penis longer than posterior cirri, setulose, rugulose.

*Length* of walls, 8 mm.; greatest basal diameter, 8 mm.

*Colour*.—White in spirit.

*Locality*.—33° 53' S., 25° 51' E. (Algoa Bay), 26 fathoms, 4 specimens; Seal Island, S.S.W., distant  $\frac{1}{2}$  mile (False Bay), 12 fathoms, 1 specimen; 33° 50' S., 25° 54' E. (Algoa Bay), 1 specimen. S.S. "Pieter Faure," 6/12/98, 24/8/03, and 11/11/98. (S.A.M., Nos. A 4213-5.)

One specimen (No. A 4215) is more elongate, the walls measuring 11 mm., and the greatest width is above the base, the base measuring

only 5 mm. Except for this difference, there is nothing to separate this specimen from the others.

*Acasta pectinipes* Pilsbry.

1912. *Acasta pectinipes*. Pilsbry, Proc. U.S. Nat. Mus., vol. xlii, p. 294.  
 1913. „ *nitida*. Hoek, Siboga Exp. Monogr., 31B, p. 237, pl. xxiv, figs. 17-19; pl. xxv, figs. 1-3.  
 1916. „ *pectinipes*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 247.

For purposes of comparison I give the following description of the Cape specimens.

Base cup-shaped, with faint lines of growth, upper edge minutely crenulate, no internal teeth. In young specimens of 3-4 mm. capitular height, the base is quadrangular, very slightly convex, scarcely 1 mm. in depth, with a minute central point and 4 shallow grooves radiating to the corners. In a specimen of 6 mm. capitular height, the base is regularly cup-shaped, conical, 4 mm. deep, and oval at the top. In the largest specimen of 8 mm. capitular height, the base is also 8 mm. deep, oval at the top, regularly conical for the lower  $\frac{2}{3}$ , and then cylindrical as far as the walls, which slightly overlap the edge of the base. This series was taken out of the same sponge and shows the changes in shape undergone during growth. The smallest and the largest might quite easily have been considered specifically distinct had they occurred separately.

All the parietes incurved at the top. Orifice not very large, nor deeply notched.

Parietes internally grooved, corresponding with external ridges, but not also horizontally ribbed as in *nitida*. External ridges denticulate.

Carino-lateral pariete very narrow, forming a narrow rib reaching to base, where it is about  $\frac{1}{7}$  (or less) the width of the lateral pariete, ala not broader than pariete, but radius widening until it is a little broader, neither ala nor radius extending more than half-way down pariete, leaving a narrow membrane-covered slit between the parietes. Similar slits are left between the rostrum and the lateral parietes. In young specimens they are so slight as to escape notice, and certainly would have been overlooked had not the young specimens been in the same series with adult specimens.

Scutum with short tergal margin, nearly straight, occludent margin toothed, longitudinal ribs and growth-ridges moderately strong,

equally developed, producing a cancellate appearance, in the largest specimens the later growth-ridges predominate, so that the cancellate appearance is seen only on the apical half, even here it is never as strongly marked as in the tergum; articular ridge strong, articular furrow deep, cavity for depressor muscles shallow.

Tergum broad, roughly equilateral, the 3 margins being about equal, carinal margin convex, scutal margin slightly concave, spur short and broad, but not more than  $\frac{1}{3}$  width of valve, its distal margin truncated parallel with basal margin. Externally the longitudinal furrow begins only in the lower half, whence it widens rapidly to the whole width of the spur. Carinal portion of valve strongly cancellate, but in the largest specimens, as in the scutum, this is only seen at the apical half, farther down the growth-ridges predominate. Scutal portion with growth-ridges only. Articular ridge distinct, articular furrow deep, depressor crests very faint.

Anatomy of a medium-sized specimen (capitulum height, 6 mm.).

Mandible, 2nd and 3rd teeth double, 4th and 5th small, inner angle blunt, non-spinose.

Maxilla, inner edge straight, 7 spines between outer and inner large pairs.

First cirrus, rami very unequal, 7- and 19-jointed.

Second cirrus, rami slightly unequal, 8- and 10-jointed.

Third cirrus, rami equal, 12- and 13-jointed, unarmed.

Fourth cirrus, rami equal, 24- and 30-jointed, 2nd joint of peduncle with 12 recurved teeth, first 10 joints of anterior ramus with recurved teeth, 2 and 1 on 9th and 10th joints respectively, posterior ramus unarmed.

Fifth cirrus, rami equal, ca. 35-jointed, unarmed.

Sixth cirrus, rami equal, ca. 40 jointed. Each joint of 5th and 6th cirri with 3 pairs of setae on anterior margin.

Penis 12 mm. long, tapering to an acute apex, rugulose, setulose.

*Length.*—Up to 16 mm.; greatest diameter, up to 10 mm.

*Colour.*—Pinkish or salmon, the colour deepest at the apices of the parietes.

*Locality.*—Cape Morgan, N.N.W., distant 7 miles, 52 fathoms, 1 specimen; False Bay, 17 fathoms, 4 specimens (juv. and adult); Umkomaas River, N.W. by W.  $\frac{1}{2}$  W., distant 5 miles (Natal), 40 fathoms, 2 specimens; 33° 6' S., 28° 11' E. (off East London), 85 fathoms, 1 specimen. S.S. "Pieter Faure," 12/8/01, 8/10/02, 31/12/00, and 28/1/99. (S.A.M., Nos. A 311, A 3924, A 4219, and A 4221.)

*Geogr. Distribution.*—Philippine Islands, 18 fathoms (Pilsbry:

*pectinipes*); 6° 15' S., 110° 50' E. (Java Sea), 40-50 metres (Hoek : *nitida*).

The number of external "prickly threads" varies, increasing with age. The strength of the "prickles" also varies, some being smooth points, others being almost tuberculate and strongly scabrous.

Pilsbry did not describe the animal of his specimens, if it was present. It will be noticed that there are slight differences between my account and Hoek's description of the anatomy of *nitida*, the chief being the absence of recurved teeth on the 5th cirrus in the Cape specimens. This, however, is not important enough to overrule the many other points of agreement. Similarly the presence of the horizontal ribs on the interior of the parietes is not a feature of great consequence; and the absence of the slits between the parietes may well be due to Hoek's specimens not having been adult. I had already come to the conclusion that Hoek's *nitida* was synonymous with Pilsbry's *pectinipes*, before receiving Pilsbry's 1916 paper, in which I find an authoritative confirmation of my views.

The cancellate tergum and the external sculpturing are the most characteristic features of this species.

*Acasta membranacea* n. sp.

Conical, walls slightly converging. Orifice large, deeply notched. Base nearly or quite flat, thin, membranous, completely so in all the small and some of the larger specimens, partially calcified in other large specimens round the periphery where the depressor muscles of the opercular valves are attached, in one case feebly calcified all over.

Parietes thin, not porous, externally with growth-lines and numerous irregular short calcareous projections, leaving where broken off pore-like scars; internally smooth, lateral margins more or less strongly ribbed, sheath with slight horizontal ridges. Carino-lateral pariete  $\frac{1}{4}$  (or less) width of lateral pariete. Carina longer than rostrum. Radii not wider than their parietes, summits very oblique.

Scutum higher than wide, with moderately strong growth-ridges, longitudinal striae sometimes distinct, sometimes quite obsolete, articular ridge strong, oblique below, adductor ridge and cavities for adductor and depressor muscles well-marked, occludent margin somewhat inflexed forming at the basal angle a small elongate pit.

Tergum strongly beaked, the beak sometimes moderately stout, sometimes very narrow and elongate, falcate, scutal margin thus concave, basal margin shortest, surface with growth-ridges only, a

moderately deep and narrow groove from apex to the spur, which is  $\frac{1}{3}$  as long and  $\frac{1}{4}$  as wide as basal margin, moderately narrow, obliquely truncate, basi-scutal angle distinct, acute; width of groove and consequently of the spur is a little variable.

Mandible, 2nd tooth double, 4th small, 5th not distinct from blunt inner angle.

Maxilla, inner margin straight or with a very small notch, 8-10 spines between the 2 outer large spines and the 2 inner large ones.

First cirrus, posterior 18-jointed ramus twice as long as anterior 8-jointed ramus, the joints of the latter broader than long, almost moniliform, strongly setose.

Second cirrus, rami subequal, 10-12-jointed.

Third cirrus, rami subequal, 15-18-jointed, anterior ramus with 3-4 small upturned spines on all the joints except the distal 2 or 3.

Fourth cirrus, rami 25-27-jointed, both rami with 4-6 small upturned spines on all the joints except the distal ones, posterior margin also of 1st joint (which is longer than the others) of anterior ramus with a row of small upturned spines.

Fifth and sixth cirrus, rami 30-32-jointed, posterior margin of 1st joint spinose as in 4th cirrus. Each joint with 3 pairs of setae on anterior margin and 1 pair on posterior apex.

Penis long, rugulose, setulose, apex subacute.

*Length* of carina, up to 14 mm.; greatest basal width, up to 10 mm.

*Colour*.—In spirit, white.

*Locality*.—Durnford Point, N.W.  $\frac{3}{4}$  W., distant 12 miles (Zululand), 90 fathoms, 1 specimen; Umhloti River, N. by W.  $\frac{1}{2}$  W., distant 8 miles (Natal), 40 fathoms, 2 specimens; 33° 6' S., 28° 11' E. (off East London), 85 fathoms, several specimens; Umkomaas River, N.W. by W.  $\frac{1}{2}$  W., distant 5 miles (Natal), 40 fathoms, several specimens; Tugela River, N.W. by W., distant 3 miles (Natal), 14 fathoms, 1 specimen; Cone Point, N.W.  $\frac{1}{2}$  W., distant 4 miles (Zululand), 34 fathoms, several specimens; Umtwalumi River, N. by W., distant 7 miles (Natal), 50 fathoms, 4 specimens. S.S. "Pieter Faure," 28/2/01, 18/12/00, 28/1/99, 31/12/00, 16/1/01, 27/2/01, and 11/3/01. (S.A.M., Nos. A 3923, A 4212, A 4222-7.)

In *Pachastrella isorrhopa* Krkp. and other *Hexactinellid* sponges. This species differs from *scuticosta* Weltner, in having a membranous base, which, however, is variable, as shown above. The groove on the tergal spur is not mentioned in Gruvel's description of this species (I have not seen the original description), nor are the appendages

described. There is a possibility of running the two species together when a larger series is forthcoming.

Gen. TETRACLITA Schumacher.

1817. *Tetracilita*. Schumacher, Essai d'un nouveau système des Habitations des Vers Testacés, p. 91.  
 1817. *Conia*. Leach, Journ. Phys., vol. lxxv, p. 69.  
 1822. *Polytremia*. Ferussac, Dict. class. d'Hist. Nat., vol. ii, p. 144.  
 1854. *Tetracilita*. Darwin, Monogr. Balanid., p. 321.  
 1905. „ Gruvel, Monogr. Cirrhip., p. 284.  
 1913. „ Hoek, Siboga Exp. Monogr., 31B, p. 253.  
 1916. „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 248.

Key to the South African species.

1. Parietes with several rows of pores.
  - a. Surface, smooth or ribbed. Scutum with articular and adductor ridges parallel not joining . . . . . *squamosa* (Brug.).
  - b. Surface with serrated ribs. Scutum with articular and adductor ridges joining and forming a cavity which runs up to the apex . . . *serrata* Darw.
2. Parietes with a single row of pores . . . subgen. *Tesseropora rosea* (Krss.).

\**Tetracilita squamosa* (Brug.).

1789. *Balanus squamosus*. Bruguière, Encycl. Meth. (Vers), vol. i, p. 170, pl. clxv, figs. 9, 10.  
 1790. *Lepas porosa*. Gmelin, Syst. Nat., ed. 13, vol. i, pt. 6, p. 3212.  
 1854. *Tetracilita porosa*. Darwin, loc. cit., p. 329, pl. x, figs. 1, a-m.  
 1897. „ „ Weltner, Arch. Naturg., vol. lxiii, pt. 1, p. 257.  
 1905. „ „ Gruvel, loc. cit., p. 287, figs. 308 B, 312.  
 1911. „ „ Krüger, Beitr. Cirrip. Ostas, p. 60, pl. iv, figs. 41b, c.  
 1913. „ „ Hoek, loc. cit., p. 254.  
 1916. „ *squamosa*. Pilsbry, loc. cit., p. 249 (with new subspecies).

Widely distributed in tropical and subtropical regions. Not represented in the collection.

*Tetrachlita serrata* Darwin.

1854. *Tetrachlita serrata*. Darwin, Monogr. Balanid., p. 234, pl. x, figs. 2, *a-d*.  
 1897. „ „ Weltner, Arch. Naturg., vol. lxiii, pt. 1, p. 258.  
 1905. „ „ Gruvel, Monogr. Cirrhip., p. 289, fig. 313.  
 1906. „ „ Annandale in Herdman's Ceylon Pearl Fish. Suppl. Rep., 31, p. 144.  
 1910. „ „ Stebbing, Gen. Cat. S.A. Crust., p. 571.  
 1911. „ „ Krüger, Beitr. Cirrip. Ostas, p. 61, pl. iv, fig. 41*a*.  
 1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 249.

According to Weltner and Krüger, a series of transitional forms can be found between *squamosa* and this species (see Krüger, pl. iv, figs. 41*b*, 2-7), showing that *serrata* should be regarded only as a variety of *squamosa*.

Specimens in the collection from Table Bay and False Bay (R. M. Lightfoot and K. H. B.); Cove Rock, near East London (s.s. "Pieter Faure"); Durban (K. H. B.). (S.A.M., Nos. A 298, A 306, and A 320.)

There are also 3 large specimens, 30 mm. basal diameter, in the "Pieter Faure" collection bearing the reference number 2250 (S.A.M., No. A 297). The corresponding locality in the log-book is "Lion's Head, N. 67° E., distant 25 miles (off Cape Peninsula), 131 fathoms." From the depth given I think one may legitimately conclude that the number "2250" is either a mistake or has been placed in the wrong bottle, as the members of this genus are found only in the littoral zone.

Other localities are Algoa Bay (Darwin) and Pondoland (Weltner), Ceylon (Annandale).

Subgen. TESSEROPORA Pilsbry.

1916. *Tesseropora*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 259.  
 1921. *Tessepora* [*sic*]. Nilsson-Cantell, Zoolog. Bidrag. Upsala, vol. vii, p. 365.

\**Tetrachlita rosea* (Krss.).

1848. *Conia rosea*. Krauss, Die Südafrik. Moll., p. 136, pl. vi, fig. 28.  
 1854. *Tetrachlita rosea*. Darwin, Monogr. Balanid., p. 335, pl. x, figs. 3, *a-d*.

1905. *Tetracrita rosea*. Gruvel, Monogr. Cirrhip., p. 286, fig. 310.  
 1910. „ „ Stebbing, Gen. Cat. S.A. Crust., p. 571.  
 1916. „ „ Pilsbry, *loc. cit.*, p. 760, pl. lviii, fig. 4.

Not represented in the collection by South African specimens.

*Geogr. Distribution*.—Australia.

Subfam. CHELONIBIINAE.

1916. *Chelonibiinae*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 262.

Gen. CHELONIBIA Leach.

1817. *Chelonibia*. Leach, Journ. Phys., vol. lxxxv, p. 68.  
 1818. *Coronula* (part). Lamarek, Anim. sans Vertebr., vol. v, p. 385.  
 1854. *Chelonobia*. Darwin, Monogr. Balanid., p. 382.  
 1905. „ Gruvel, Monogr. Cirrhip., p. 266.  
 1916. *Chelonibia*. Pilsbry, *loc. cit.*, p. 262.

*Key to the South African species.*

1. Radii well-developed, though narrow, usually notched. Cavities between the basal septa rather deep . . . . . *testudinaria* Linn.
2. Radii not developed, or very narrow. Cavities filled up almost to the base, septa much interrupted. Shell very thick and heavy . . . *caretta*. (Spengl.).

*Chelonibia testudinaria* (Linn.).

1758. *Lepas testudinaria*. Linnaeus, Syst. Nat., ed. 10, p. 668.  
 1825. *Astrolepas rotundarius*. Gray, Ann. Philos. (N.S.), vol. x, p. 105.  
 1854. *Chelonobia testudinaria*. Darwin, *loc. cit.*, p. 392, pl. xiv, figs. 1, a-d, 5; pl. xv, fig. 1.  
 1905. „ „ Gruvel, Monogr. Cirrhip., p. 267, fig. 297, A.  
 1906. „ „ Annandale in Herdman's Ceylon Pearl Fish. Suppl. Rep., 31, p. 143.  
 1911. „ „ Krüger, Beitr. Cirrip. Ostas, p. 57, text-figs. 121-125.  
 1916. „ „ Pilsbry, *loc. cit.*, p. 264, pl. lxii, figs. 1-4.

Widely distributed in all tropical and warm temperate seas on the loggerhead turtle.

Specimens are in the collection from Table Bay, without date or donor. (S.A.M., No. 1340.)

*Chelonibia caretta* (Spengl.).

1790. *Lepas caretta*. Spengler, Skr. Natur. Selsk., vol. i, p. 185, pl. vi, fig. 4.  
 1854. *Chelonobia caretta*. Darwin, Monogr. Balanid., p. 394, pl. xiv, fig. 2.  
 1905. „ „ Gruvel, Monogr. Cirrhip., p. 269, fig. 297, D.  
 1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 267, pl. lxiii, figs. 5, 5a.

Two specimens, 30 mm. in diameter, on a Green Turtle (*Chelone midas*) caught in Table Bay, 1919. (S.A.M., No. A 4314.)

Specimens from Cape of Good Hope are in the Paris Museum (*teste* Pilsbry). Not mentioned by Gruvel.

*Geogr. Distribution*.—West Africa, N. Australia (Darwin); Venezuela, Massana, Torres Straits (Weltner); Saigon (Paris Museum, *teste* Pilsbry); West Indies, New Jersey, East Indies, Brazil (Pilsbry). Usually on loggerhead turtles.

Subfam. CORONULINAE.

1854. *Balaninae* (2nd sect.). Darwin, Monogr. Balanid., p. 397.  
 1907. *Coronulinae*+*Xenobalaninae*. Gruvel, Monogr. Cirrhip., pp. 8, 270, 280.  
 1916. *Coronulinae*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 268.

There are other genera of this subfamily, not represented in South Africa, which are found on turtles, manatees, snakes, and fishes.

*Key to the South African genera.*

1. Body contained within the walls. Opercular valves present.
  - a. Parietes externally ribbed. Radii broad . . . . . *Coronula*.
  - b. Tubular, annulate, without longitudinal ribs. Radii narrow *Tubicinella*.
2. Body elongate, resembling a naked Pedunculate barnacle, not contained within the walls, which are minute. Opercular valves absent . . . *Xenobalanus*.

Gen. CORONULA Lam.

1802. *Coronula*. Lamarck, Ann. Mus., vol. i, p. 464.  
 1854. „ Darwin, Monogr. Balanid., p. 397.  
 1916. „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 271.

*Key to the South African species.*

1. Orifice much larger than basal opening. Branches of the sutural ribs asymmetrical or absent. Terga wanting or very minute.
  - a. Crown-shaped. Parietes convex, with convex rugose ribs . *diadema* (Linn.).
  - b. Depressed. Parietes with flat, beaded ribs . . . *reginae* (Darw.).
2. Orifice not larger than basal opening. Branches of the sutural ribs symmetrical. Terga present . . . . . *complanata* (Möreh).

*Coronula diadema* (Linn.).

1767. *Lepas diadema*. Linnaeus, Syst. Nat., ed. 12, p. 1108.  
 1776. „ *balaenaris*. O. F. Müller, Zool. Dan. Prodr., p. 250.  
 1854. *Coronula diadema*. Darwin, Monogr. Balanid., p. 417, pl. xv, figs. 3, 3b; pl. xvi, figs. 1, 2, 7.  
 1897. „ „ Weltner, Arch. Naturg., vol. lxiii, pt. 1, p. 254.  
 1900. „ „ Weltner, Fauna Arctica, vol. i, p. 302.  
 1900. „ „ Marloth, Tr. Philos. Soc. S. Afr., vol. xi, pt. 1, p. 1.  
 1903. „ „ Stead, Proc. Linn. Soc. N.S.W., vol. xxviii, p. 944.  
 1910. „ „ Stebbing, Gen. Cat. S.A. Crust., p. 571.  
 1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 273, pl. lxv, figs. 3-4.

Widely distributed over the Northern and Southern hemisphere. On the Humpback Whale (*Megaptera*).

Stead's record, quoted by Pilsbry, is open to doubt, as he says the whale "appeared to be a Finback (*Balaenoptera*).” There are specimens in the South African Museum labelled as from *Balaena australis*. (S.A.M., Nos. 1323-5, A 229, A 305.)

*Coronula reginae* Darwin.

1854. *Coronula reginae*. Darwin, Monogr. Balanid., p. 419, pl. xv, fig. 5; pl. xvi, fig. 4.  
 1916. „ „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 275, pl. lxiv.

Stebbing in the Gen. Cat. S.A. Crust., p. 572, regards *reginae* as doubtfully distinct from *diadema*. Darwin believed that *reginae* replaced *diadema* in the Pacific.

*Distribution*.—Northern and Southern Atlantic, Pacific.

On *Megaptera*.

There are 5 specimens in the South African Museum from Table Bay. One of these bears a very strong outward resemblance to a *diadema* of the same size. (S.A.M., No. A 4300.)

*Coronula complanata* (Mörch).

1790. *Lepas balaenaris*. Spengler, Str. Naturh. Selsk., vol. i, p. 187  
(non O. F. Müller).  
1818. *Cetopirus* ,, Ranzani, Opusc. Scient., vol. ii, p. 87.  
1848. *Coronula* ,, Krauss, Die Südafrik. Moll., p. 135.  
1852. *Cetopirus complanatus*. Mörch, Catalog. Conchyl. Comes de  
Cjoldi, p. 67.  
1854. *Coronula balaenaris*. Darwin, Monogr. Balanid., p. 415,  
pl. xv, figs. 2–2*b*; pl. xvi, figs. 3, 5.  
1910. ,, *darwinii*. Stebbing, Gen. Cat. S.A. Crust., p. 572.  
1916. ,, *complanata*. Pilsbry, Bull. U.S. Nat. Mus., No. 93,  
p. 276, pl. lxiii, figs. 1, 2, 3, 3*a*.

Four specimens in the collection from Table Bay and Simonstown.  
(S.A.M., No. 1326.)

*Distribution*.—East Indies; New South Wales, West Africa; West coast South America; Norway (see Pilsbry).

Gen. TUBICINELLA Lam.

1802. *Tubicinella*. Lamarck, Ann. Mus., vol. i, p. 461.  
1854. ,, Darwin, Monogr. Balanid., p. 430.

*Tubicinella striata* Lam.

1802. *Tubicinella (major), (minor), striata*. Lamarck, *loc. cit.*, p. 463,  
pl. xxx, fig. 1.  
1806. *Lepas trachealis*. Shaw, Shaw and Nodder's Naturalist's Mis-  
cellany, vol. xvii, pl. dccxxvi.  
1848. *Tubicinella balaenarum*. Krauss, Die Südafrik. Moll., p. 135.  
1854. ,, *trachealis*. Darwin, *loc. cit.*, p. 431, pl. xvii,  
figs. 3, *a–c*.  
1900. ,, ,, Marloth, Tr. Phil. Soc. S. Afr., vol. ii,  
pt. 1, p. 1.  
1903. ,, ,, Gruvel, Deutsch Südpol. Exp.,  
vol. ii, p. 216.

1910. *Tubicinella striata*. Stebbing, Gen. Cat. S.A. Crust., p. 573.

1916. „ *major*. Pilsbry, Bull. U.S. Nat. Mus., No. 93,  
p. 281, pl. lxxv, fig. 5.

Specimens in the collection from the Southern Right Whale (*Balaena australis*) taken in Table Bay and False Bay. (S.A.M., Nos. 1327, A 300, A 304.)

*Distribution*.—Southern Atlantic Ocean.

Gen. XENOBALANUS Stnstrp.

1851. *Xenobalanus*. Steenstrup, Vedensk. Medd. Naturh. For.  
Kobenhaven, pl. iii, figs. 11–15.

1852. „ Steenstrup, Overs. K. dansk. Vidensk. Selsk.  
Forhl. Telt., 1852, pp. 158, 161.

1852. *Siphonicella*. Darwin, Monogr. Lepadidae, p. 156.

1854. *Xenobalanus*. Darwin, Monogr. Balanidae, p. 438.

1905. „ Gruvel, Monogr. Cirrhip., p. 280.

1916. „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 282.

*Xenobalanus globicipitis* Stnstrp.

1851. *Xenobalanus globicipitis*. Steenstrup, *loc. cit.*, pl. iii, figs.  
11–15.

1852. „ „ Darwin, *loc. cit.*, p. 440, pl. xvii,  
figs. 4, *a-c*.

1905. „ „ Gruvel, *loc. cit.*, p. 281, figs.  
304, 305.

1916. „ „ Pilsbry, *loc. cit.*, p. 283, pl. lxxv,  
figs. 2–2*b*, and var. *pallidus*,  
p. 284, pl. lxxv, fig. 1.

1920. „ „ Calman, Ann. Mag. Nat. Hist. (9),  
vi, p. 165.

1923. „ „ *natalensis*. Stebbing, Fish. Mar. Surv. S. Afr.,  
Spec. Rep., 3, p. 12, pl. xvi.

The reasons given for the institution of the species *natalensis* are, in my opinion, quite inadequate. Even the “rough sketch” (explanation to pl. xvi) of the shell belies Stebbing’s statement that it is only 5-rayed.

I have examined 4 specimens received from Mr. Bell-Marley from the tail of *Tursiops catalaniae*, caught in Natal, 1919 (S.A.M., No. A 4317), evidently part of the same catch from which Stebbing received his specimens. All four specimens have a typical 6-rayed

shell. The penis is large, as described by Stebbing, but the character of only 4 teeth in the mandible is not a constant one; it is probable that Stebbing overlooked the 5th tooth, which is minute.

Further, I have seen a large number of perfectly typical specimens from the tail-flukes of a blue whale caught off Saldanha Bay (S.A.M., No. A 4320, collected by Mr. J. Drury, 1922).

This remarkable barnacle bears an extremely close resemblance to a stalked barnacle, especially to *Conchoderma auritum*; but is always attached directly to the skin of its host, whereas *Conchoderma* is always attached to another sessile barnacle.

*Distribution*.—Northern Atlantic, on the Black Fish (*Globicephalus*), Finner Whale (*Balaenoptera physalis*); Antarctic (on Finner Whale).

#### Fam. CHTHAMALIDAE.

1854. *Chthamalinae* (subfam.). Darwin, Monogr. Balanid., p. 446.

1916. *Chthamalidae*. Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 290.

#### Key to the South African genera.

- |                              |                    |
|------------------------------|--------------------|
| 1. Compartments, 6 . . . . . | <i>Chthmalus</i> . |
| 2. Compartments, 8 . . . . . | <i>Octomeris</i> . |

#### Gen. CHTHAMALUS Ranz.

1817. *Chthamalus*. Ranzani, Opusc. Scient., vol. i, p. 276.

1818. „ Ranzani, *ibid.*, vol. ii, p. 83.

1837. *Euraphia*. Conrad, Journ. Ae. Nat. Sei. Philad., vol. vii, p. 261.

1854. *Chthamalus*. Darwin, Monogr. Balanid., p. 447.

1916. „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 293.

1921. „ Nilsson-Cantell, Zool. Bidrag. Upsala, vol. vii, p. 274.

#### *Chthamalus dentatus* Krss.

1848. *Chthamalus dentatus*. Krauss, Die Südafrik. Moll., p. 135, pl. vi, fig. 27.

1854. „ „ Darwin, *loc. cit.*, p. 463, pl. xviii, figs. 3, a-c.

1910. „ „ Stebbing, Gen. Cat. S.A. Crust., p. 574.

1921. „ „ Nilsson-Cantell, *loc. cit.*, p. 282, fig. 52.

Pilsbry in his Monograph has given on pp. 295, 296 a grouping of the species based primarily on the mandible. He has added a footnote

stating that as he has not dissected *C. dentatus* (and others) it may have been placed in the wrong group. As a matter of fact it is wrongly placed. It should be grouped under 1a, having a mandible like that figured for *C. stellatus*, fig. 8, A D, in Pilsbry's work. Darwin's description of the inferior part as being "coarsely pectinated" is certainly misleading. (See also Nilsson-Cantell, 1921, p. 275.)

Specimens from Table Bay, False Bay, and Durban (K. H. B.). (S.A.M., Nos. 1346, 1451, A 302, and A 3904.)

*Geogr. Distribution*.—West Africa, Loanda, Gold Coast, Madagascar, Gulf of Aden. Littoral and attached to ships' bottoms.

#### Gen. OCTOMERIS Sowerby.

1825. *Octomeris*. Sowerby, Zool. Journ., vol. ii, p. 244.  
 1854. „ Darwin, Monogr. Balanid., p. 482.  
 1916. „ Pilsbry, Bull. U.S. Nat. Mus., No. 93, p. 334.  
 1921. „ Nilsson-Cantell, Zool. Bidrag. Upsala, vol. vii,  
 p. 298.

#### *Octomeris angulosa* Sow.

1825. *Octomeris angulosa*. Sowerby, *loc. cit.*, p. 244, pl. xii,  
 figs. 1-11.  
 1854. „ „ Darwin, *loc. cit.*, p. 483, pl. xx, fig. 2a, b.  
 1910. „ „ Stebbing, Gen. Cat. S.A. Crust., p. 575.  
 1916. „ „ Pilsbry, *loc. cit.*, p. 334.

Young specimens from a sheltered position at Smitswinkel Bay (False Bay) show very strong longitudinal ribs on the parietes, and the uncorroded opercular valves have prominent growth-ridges. Basal margin of scutum straight.

Specimens from Table Bay, False Bay (K. H. B.), Port Elizabeth (Mrs. T. V. Paterson), and Durban (K. H. B.). (S.A.M., Nos. 1344, 1345, A 308, A 315, A 319, and A 328.)

*Geogr. Distribution*.—There is a typical specimen in the collection labelled as from "Australia." (S.A.M., No. 1331.)

#### ASCOTHORACICA.

1905. *Ascothoracica*. Gruvel, Monogr. Cirrhip., p. 336.

#### Fam. DENDROGASTERIDAE.

1905. *Dendrogasteridae*. Gruvel, *loc. cit.*, p. 345.

Gen. DENDROGASTER Knip.

1890. *Dendrogaster*. Knipovitsh, Biol. Centralb., vol. x, p. 707.

\**Dendrogaster arborescens* le Roi.

1905. *Dendrogaster arborescens*. le Roi, Zool. Anz., vol. xxix, p. 399.

1907. „ „ le Roi, Zeitsch. Wiss. Zool., vol. cxxxvi, p. 100.

In the *Asteroid*, *Dipsacaster sladeni* ("Valdivia" Exp.).

Dr. H. L. Clark of the Museum of Comparative Zoology, who has reported on the "Pieter Faure" collection of Echinoderms (Ann. S. Afr. Mus., vol. xiii, pt. 7, 1923), and who, at my request, kept a special look-out for parasitic Cirripedes, tells me that he found no specimens either of this or any other form.

ACROTHORACICA.

1905. *Acrothoracica*. Gruvel, Monogr. Cirrhip., p. 310.

1909. „ Calman in Lankester's Treatise, p. 140.

1910. „ Stebbing, Gen. Cat. S.A. Crust., p. 575.

Fam. KOCHLORINIDAE.

1909. *Kochlorinidae*. Calman, loc. cit., p. 140.

Gen. KOCHLORINE Noll.

1872. *Kochlorine*. Noll, Ber. Senckenb. Ges., 1871-2, p. 24.

1897. „ Weltner, Arch. Naturg., vol. lxiii, pt. 1, p. 237.

\**Kochlorine bihamata* Noll.

1883. *Kochlorine bihamata*. Noll, Zool. Anz., vol. vi, No. 147, p. 471.

1883. „ „ Hoek, Challeng. Rep., vol. viii, p. 6.

1905. „ „ Gruvel, Monogr. Cirrhip., p. 334.

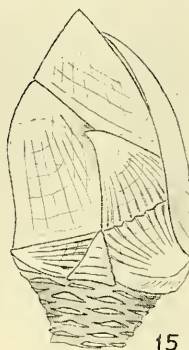
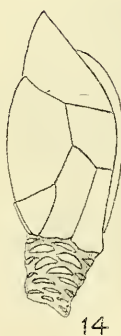
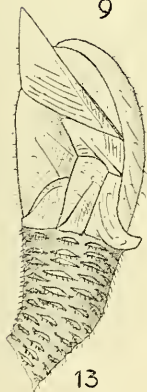
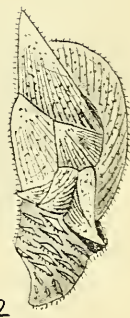
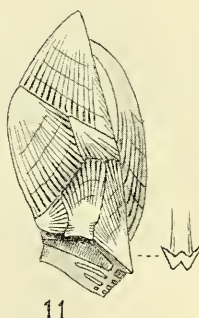
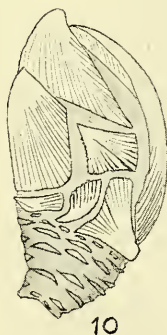
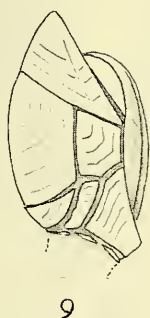
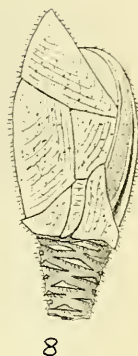
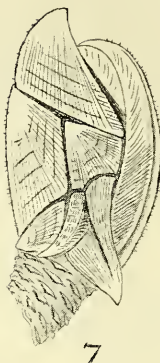
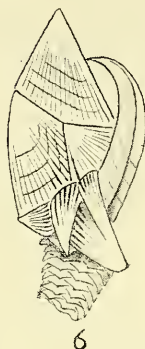
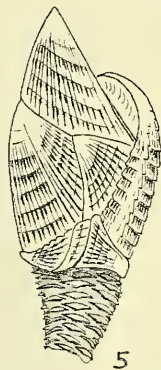
1910. „ „ Stebbing, Gen. Cat. S.A. Crust., p. 575.

In cavities in the shell of *Haliotis*, Cape of Good Hope (Noll).

## EXPLANATION OF PLATE.

FIG.

1. *Smiliium hypocrites* n. sp. ♂ × 5, cleaned.
2. *Smiliium hypocrites* n. sp. ♀ × 4, in its natural position on a branch of *Villogorgia mauritiensis*, concealed by the coenosarc and polyps of the latter.
3. *Scalpellum ornatum* (Gray), aberration. ♀ × 5.
4. *Scalpellum faurei* n. sp. ♀ × 6.
5. *Scalpellum cancellatum* n. sp. ♀ × 5.
6. *Scalpellum subalatum* n. sp. ♀ × 6.
7. *Scalpellum capense* n. sp. ♀ × 7.
8. *Scalpellum agulhense* n. sp. ♀ × 6.
9. *Scalpellum porcellanum* n. sp. ♀ × 8.
10. *Scalpellum brachium-cancri* Welt. ♀ × 3.
11. *Scalpellum brevicaulis* n. sp. ♀ × 10. With dorsal view of carinal latus.
12. *Scalpellum eumitos* n. sp. ♀ × 3.
13. *Scalpellum uncinatum* n. sp. ♀ × 5.
14. *Scalpellum natalense* n. sp. ♀ × 10.
15. *Scalpellum bottellinae* n. sp. ♀ × 9. The dotted line indicates the size of the male.
16. *Acasta sulcata* Darwin, var. *anchoris* n. ♀ × 8.



K.H.B. del.



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